

ARITHMETICK

IN THE

Plainest and most Concise METHODS

hitherto Extant. 8535. 6. 46.

WITH

New Improvements

For the Dispatch of BUSINESS in all the several

RULES.

AS ALSO

FRACTIONS Vulgar and Decimal,
wrought together after a New Method, that ren-
ders both easy to be understood in their NATURE
and USE.

The whole Perus'd and Approv'd of, by
the most eminent Accomptants in the several Offices
of the REVENUE, viz. Customs, Excise, &c. as
the only Book of its Kind, for Variety of RULES
and Brevity of WORK.

The NINETEENTH EDITION, with considerable
Additions, and curious Improvements by the Author,
GEO. FISHER, Accomptant.

To this EDITION is added

An APPENDIX, not in some of the Former.

BELFAST:

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and CROWN in Bridge-street. M,DCC,LXXV.



To the Right Worshipful

Sir Samuel Clark, *Knt.*

And Merchant of the Honourable

CITY of L O N D O N.

S I R,

WHEN I consider'd of your great Abilities and most consummate Knowledge in things of this Nature, I was under great Hesitations, lest I should appear too Presumptuous in Dedicating such a Trifle to your Worship: But then, Sir, again considering, that your Candour, and obliging Condescension, was equally as great; and also encouraged by Favours formerly received, I have ventured to shelter this Treatise of ARITHMETICK under your Great Name; and if it gain but your Approbation, I shall not be ambitious of any other Imprimatur; but acquiesce with some Assurance, that the Book will meet with a favourable

A 2

and

DEDICATION.

and kind Reception in the World. In this Impression, I have endeavoured to be as correct as possible, and have made considerable Additions and Improvements in the several Rules; which, with all humble Submission, encourages me to hope may in Part excuse for my Presumption of troubling your Worship; and remain with all possible Respect and Deference,

Your Worship's

most Devoted,

and most Obedient

humble Servant,

GEO. FISHER.



T H E

P R E F A C E.

SOMETIME before I attempted, or had any Thoughts of compiling this Book, a very good Friend of mine, (Mr. *Wilkins*, *Russia* Merchant) desired me to draw him out some few Notes of the shortest Ways and Methods of Working some of the Rules in *Arithmetick*; which when I set about, endeavouring to oblige my Friend, I hit on several Things, (not thought on by me before) which I hop'd, if made publick, might be of good Service to the World.

If it be objected, that the Books on this Subject are too numerous already, I answer, That as many as there are extant, yet there are none so perfect, but there may be Improvements made upon them; and if so, and that those Improvements may be of any considerable Use and Benefit to Mankind, why may they not be made publick?

Arithmetick (said Mr. *Locke*, in his *Essay on human Understanding*) is of such general Use and Service, in all the Parts of Life and Business, that scarce any thing is to be done without it; and therefore I think there cannot be too many, or too good Instructions for its Attainment: And before either *Hodder's*, *Cocker's*, or *Ayre's* Books appear-

The P R E F A C E.

ed in the World, there were many excellent Pieces of that Science then extant, and yet their Books came abroad, and found encouraging Entertainment, and they themselves Applause for their Endeavours.

And if another improves as much upon them, as they did upon others before them, why may he not hope for some Success and Approbation? In short, if the Book meets with Encouragement but equal to the Author's Care and Endeavours, to make it the most useful of its Kind, he will have Reward enough.

As to the Work, I have gone thro' *Numeration*, *Addition* (with several useful Tables) *Subtraction*, *Multiplication* and *Division*, with so much Plainness and Perspicuity, and in such familiar and pertinent Terms, that the meanest Capacity may understand them and apply them properly.

In *Multiplication* I have been more copious than ordinary, that I might shew the excellent Uses that may be made of that Rule only, particularly in *Money*; where, by having the Price of one Thing, I have shewn how to find out the Value of many Things at that Rate: So that if a Person well understands the Methods and Intentions of the Rules and Directions therein laid down, (which are as easy as *Addition of Money*) if he makes no farther Advances in *Arithmetick*, yet he shall be able to cast up most Things that ordinarily occur in common Business, with Elegancy and Expedition.

In *Division* I have shewn the two *Italian* Ways of Dividing; and also several *Examples*, whereby a Sum many times may be sooner (and in much fewer Figures) work'd at two Divisions than at one: Likewise how Sums of divers Denominations, as of *Pounds*, *Shillings*, and *Pence*, &c. may be divided

The P R E F A C E.

divided into equal Parts, without reducing them into the lowest Name mentioned (as is generally the Practice) and is done in half the Time, and a quarter of the Figures us'd in the other Way. Also by *Division* to find, having the Value of many Things, the Price of one Thing at that Rate.

In *Reduction* I have shewn great Variety of Working, and divers Ways of abbreviating the common Methods us'd in that Rule; and how to bring *Gross Weight* into *Pounds* without multiplying.

Next I shew the shortest and best Methods of deducting the *Tare* and *Tret*, &c.

In the *Rule of Three* I have been very full in explaining its Nature and Use; with two several Methods of shortening most Operations in that Rule, as is clearly evinced by sundry Examples therein.

From thence I pass to the *Rule Inverse*; and exemplify it by Variety of *Rules* and *Examples*: As also the *Double Rule of Three Direct* and *Inverse*, with the *Rule of Three* composed of the five given Numbers.

Then the several *Rules of Practice* are taught, with greater Variety and Improvements than in any one Book of *Arithmetick* hitherto extant.

As also the *Rule of Company*, with a Method of contracting the tedious Way of working Questions in that Rule.

Likewise *Interest* at all Rates, shewn in sundry *Examples* variously wrought. With *Discount*, *Exchange*, *Profit* and *Loss*.

Then I treat of *Fractions* both *Vulgar* and *Decimal*, working one with the other in such a Method as renders both easy to be understood, and in such familiar Terms as explain their Nature and Use.

The P R E F A C E.

I have now with the utmost Care, Diligence and Probity, endeavour'd to make this Piece of *Aritbmetick* the most useful of its Kind, (considering its Bulk and Value) that is at present extant: Here is nothing abstruse or mysterious, but all plain and easy; and nothing but what will bear an intelligible Demonstration.

I have gone through the whole Book, Line by Line, and have taken all due Care to correct what was amiss in the other Impressions; and as there was no other Hand in the Revival made use of but my own, I can with greater Assurance affirm, and with the more Confidence assert, that the Book is now entirely corrected: And the *Additions* which are very numerous and considerable, (almost in every Rule) are now, short and very concise in Operation; and pertinently interspers'd thro' the whole, as I had Opportunity and saw Occasion.

If there should, by Chance, be a Transposition of a Letter, (tho' there hath been great Care taken of that also) or by a greater Chance, a false Figure, or Cypher, or a misplaced one, I hope, nay, I doubt not, but the truly judicious, and candidly ingenious Readers will excuse me for them; for tho' all may take Care, yet there's none infallible. But I can with a modest Boldness assure them, there is no Occasion for an *Errata* Page, which may discourage them at Beginning, or cool them at the latter End of the Book.

T H E

T H E

C O N T E N T S.

CHAP. I. *Of Numeration, with various Examples and Methods of Reading and Writing Numbers.*

II. *Addition of whole Numbers, comprehending that of Money, Weight, Measure, &c. with very useful and necessary Tables to each Rule.*

III. *Subtraction of whole Numbers, in Money, Weight and Measure, with pertinent and familiar Examples for the full and easier understanding its Nature and Use.*

IV. *Multiplication of whole Numbers, with great Variety in the several Ways of Working that Rule; and also new Methods to render it as useful in Business, as if the Learner understood the Rule of Three and Practice.*

V. *Division of whole Numbers, with new Improvements, and how to make it answer many Questions that seem to require the Rule of Three for their Solution.*

VI. *Reduction of Money, Weight and Measure, with sundry Examples of Improvement, and contracting several Things in that Rule; with a Method of reducing Gross Weight into Pounds without Multiplication.*

VII. *Of Tare and Tret, &c. with great Variety in deducting them in the general and particular way of Business.*

VIII. *The Single Rule of Three Direct, with great Improvements, and two Methods of contracting most Questions in that Rule.*

IX. *The Single Rule of Three Inverse, explained, improv'd, and taught by sundry and various Examples.*

X. *The Double Rule of Three Direct, with great Variety; and how to work any Question therein, by a Rule composed of the five given Numbers.*

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XI. The Double Rule of Three Inverse, *as also how to operate any Question in that Rule, by a Rule of five Numbers.*

XII. Rules of Practice, *with greater Variety and Brevity than is in any one Book extant.*

XIII. The Rule of Company, or Partnership, *with or without Time; as also how to contract the tedious or common Methods of working Questions in that Rule.*

XIV. Barter, *with the divers Methods of exchanging one Sort of Goods for Another.*

XV. Interest, *with several Examples variously wrought; as also several other useful things work'd by the same Methods that do not come under the Denomination of Interest, as Provision, Avarage, &c.*

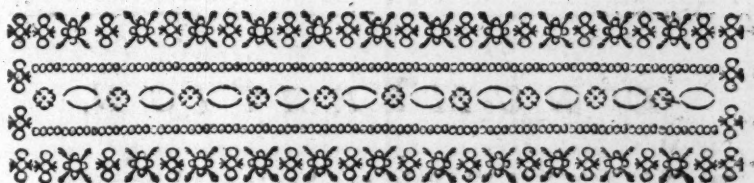
XVI. Discount, *with sundry Examples and Methods of Operations.*

XVII. Exchange in various Examples; *with Tables of the several Species of Foreign Money, and their English Value, &c.*

XVIII. Profit and Loss, *with facile and concise Methods of finding the Gain or Loss, on any Commodity, either in the whole, or at so much per Cent.*

XIX. Fractions Vulgar and Decimal, *work'd together in such intelligible Order, that the meanest Capacity may understand the Nature and Use of both. Also, The Rule of Three in Fractions, Vulgar and Decimal, and some practical Examples of Interest wrought decimally, &c.*

XX. An Appendix, *containing, the Construction and Uses of Tables for Calculating Questions in Compound Interest, and Annuities, or Leases, in Possession, or Reversion.*



ARITHMETICK,

WITH

NEW IMPROVEMENTS,

*In the Plainest and most Concise METHODS
hitherto extant.*

CHAP. I.

ARITHMETICK is the Art of casting Accompts by Number, and hath these Five Parts, *viz.* NUMERATION, ADDITION, SUBTRACTION, MULTIPLICATION, and DIVISION, which ought thoroughly to be known and understood; for by these Rules only, the whole Art is attainable, all other being wrought by them.

Of

Of NUMERATION.

NUMERATION teaches to read or write any Sum or Number, known or proposed.

To which End observe, That all Numbers whatsoever, are express'd by, or compos'd of, those ten Figures or Characters, *viz.*

One,	Two,	Three,	Four,	Five,	Six,
1	2	3	4	5	6
	Seven,	Eight,	Nine,	Cypher.	
	7	8	9	0	

The first Nine of these are called Significant Figures, to distinguish them from the 0, or Cypher, which, of itself, is insignificant, and therefore, by some is called a Nought; but it serveth to increase or decrease the Value of other Figures, according as it is placed.

Every one of the Nine Digits hath two Values; the one certain, by its Form, the other uncertain, by its Place.

The Value of a Figure may be said to be certain, when it stands alone, without any Figure or Cypher annex'd to it: Or, if it stands in the first Place, or Place of Units, in a Number; for then it never signifies any more than its own simple Value; as 2 is but Two, 6 but Six.

The Value of a Figure may be said to be uncertain, with Respect to the Place it is found in: So any of the Nine Figures in the Place of Units, signifies but its simple Value, (as was said before) but in the second Place it is to be accounted so many Tens, as it contains Units. As 5, in the first Place, is but Five; but in the second Place it signifies so many Tens, or Fifty. So that 5 may signify Five, or Fifty, or Five Hundred, or Five Thousand; and 7 may signify 7, or Seventy, or Seven Hundred Thousand, &c.

So

So every Figure is increased in Value, by a Tenfold Proportion, from the Right Hand to the Left. As, in the first Place, it is so many Units, or Ones; in the second Place, so many Tens; in the third Place, so many Hundreds; in the fourth, so many Thousands; in the fifth, so many Ten Thousands; in the sixth, so many Hundred Thousands; in the seventh, so many Millions, &c.

Admit this Number for Explanation, *viz.* 1234567, the 7 is only seven Units, or seven; but the 6 in the second Place is six times Ten, or sixty; the 5 in the third Place, an hundred times Five, or five Hundred; and 4 in the fourth Place, a thousand times Four, or four thousand; the 3, three times ten thousand, or thirty thousand; the 2, in the sixth Place, two hundred Thousand; and 1, in the seventh Place, one Million. Thus the Order of Places is accounted from the Right Hand to the Left, but to be read from the Left Hand to the Right, thus: one Million, two Hundred, thirty four Thousand, five Hundred, Sixty-seven.

If any Figure hath a Cypher, or Cyphers, joined to it it will still retain the Value of its Place, as much as if joined with any other Figure, or Figures, in the room of the Cypher or Cyphers. So if to the Figure 5, there be annexed a Cypher thus (50) its Value is five Tens, or Fifty; because it stands in the second Place, or Place of Tens, or, if it have two Cyphers joined with it, thus, (500) its Value is five Hundred; because it possesseth the Place of Hundreds, or third Place, &c.

For the easier understanding the foregoing Directions, and better reading any Number, observe the following *TABLE*.

The Numeration TABLE.

Places	Hundreds of Millions			Tens of Millions			Millions			Hundreds of Thousands			Tens of Thousands			Thousands			Hundreds			Tens			Units			Milli.	Thousands	Units
	9	8	7	6	5	4	3	2	1	9	8	7	6	5	4	3	2	1	9	8	7	6	5	4	3	2	1			
	9	8	7	6	5	4	3	2	1	9	8	7	6	5	4	3	2	1	9	8	7	6	5	4	3	2	1	9	8	7
		9	8	7	6	5	4	3	2																					
			9	8	7	6	5	4	3																					
				9	8	7	6	5	4																					
					9	8	7	6	5																					
						9	8	7	6																					
							9	8	7																					
								9	8																					
									9																					

The first thing to be done, is to get by Heart the Value of the several Places, with their Number, at the Head of the Table, viz. Units, Tens, Hundreds, Thousands, &c. which being well understood, the Learner may thereby be capable of reading or writing any Number proposed.

And for the easier reading of the Numbers in the Table, they are, on the Right Hand, set by Periods, and over them, the Names of Units, Thousands, and Millions, and to be read thus; 987 Millions, 654 Thousands, 321. The next Line, 98 Millions, 765 Thousands, 432. And the next, 9 Millions, 876 Thousands, 543, &c.

Though

Though this Table consists but of nine Places, yet it might have been extended to twelve, fourteen, or more Places, at Pleasure. As after Hundreds of Millions, Thousands of Millions, Ten Thousands of Millions, Hundred Thousands of Millions, then Millions of Millions, &c.

As, admit this Number of Thirteen Places, viz. 1234567890123; for the easier reading of which, or any other Number, make a Point under or over every third Figure, beginning at the Right Hand, thus;

1 234 567 890 123

So that the first Point is under 1, and the last under 2, towards the left Hand; and you are to account every third Place, or Period, Hundreds, and to read it thus, 1. Million of Millions, 234 Thousands, 567 Millions, 890 Thousands, 123.

QUESTIONS.

1. What is 5 in the fifth Place?

Ans^r. By annexing four Cyphers on the Right Hand, thus, 50000; it is Fifty Thousand.

2. What is 7 in the seventh Place?

Ans^r. By putting six Cyphers on the Right Hand, thus, 7000000; it is Seven Millions.

3. How do you set down Eleven Thousand, Eleven Hundred, and Eleven?

Ans^r. Thus, 12111, { 11000 Eleven Thousand.

1100 Eleven Hundred.

11 Eleven.

Proved by
Addition.

12111 Proof.

4. How do you write Fourteen Thousand, Fourteen Hundred, and Fourteen?

Ans^r.

Answ. Thus, 15414 { 14000 Fourteen Thousand.
 1400 Fourteen Hundred.
 14 Fourteen.
 ———
 15414 *Proof.*

Proved by
Addition.

NUMBERS.

707, Seven Hundred and Seven
 4006, Four Thousand and Six
 60606, Sixty Thousand, Six Hundred and Six
 100004, One Hundred Thousand and Four
 7770405, Seven Millions, 770 Thousand 405
 500007, Five Hundred Thousand and Seven
 111111, One Hundred and Eleven Thousand, 111
 999999, A Million wanting One
 400400400, Four Hund. Millions, 400 Thousand, 400
 100000000 { Ten Thousand Times Ten Thousand,
 or, One Hundred Millions. *Revelat.*
 v. 11.
 200000000 { Two Hundred Thousand Thousand, or,
 Two Hundred Millions. *Revelat.* ix.
 16.
 2070040500 { Two Thousand and Seventy Millions,
 Forty Thousand Five Hundred.

A Table of Old Roman Numbers.

100 C.	2000 CIJ.CIJ. or, M. M.
200 CC.	3000 CIJ.CIJ.CIJ. or, M. M. M.
300 CCC.	5000 IJJ.
400 CCCC.	10000 CCIJJ.
500 D. or, IJ.	50000 IJJJJ.
600 DC.	100000 CCCIJJJ. or, CM.
700 DCC.	500000 IJJJJJ.
800 DCCC.	1000000 CCCCIIJJJJ.
900 DCCCC.	1666 MDCLXVI.
1000 M. or, CIJ.	1718 MDCCXVIII. or, CIJ. IJJCCXVIII.

CHAP.



C H A P. II.

Of ADDITION.

ADDITION is the putting two or more Numbers or Sums together, and thereby bringing them into one total Sum.

And is of one Denomination, or several.

Addition of one Denomination is, when the Numbers or several Articles from the Top to the Bottom are all of one Name; that is, all *Pounds, Gallons, Ells, Miles, Sheep, &c.*

Addition of several Denominations is, when the several Lines consist of divers Names; as *Pounds, Shillings, and Pence; Hundreds, Quarters, and Pounds; or, Yards, Quarters, and Nails, &c.*

Numbers to be added together, must be placed in such Order under one another, (it matters not which is uppermost, the greatest or least Numbers) that Units may stand under Units; Tens under Tens, Hundreds under Hundreds; Thousands under Thousands, &c.

As if you were to add 120 Foot, 44 Foot, and 34 Foot together, they must be set down one under the other, as follows, *viz.*

<i>Feet</i>		<i>Feet</i>
120	Or thus,	34
44		44
34		120

Having placed the Numbers to be added as above, draw a Line under them, and begin at the lowest Figure on the Right Hand, being the Place of Units, saying, 4 and 4 is 8, which put directly under the Line, and just under its own Rank, under 4, and 4, and 0; and then go to the next Row towards the Left Hand,

Hand, saying, 3 and 4 is 7, and 2 is 9; which also set down under the Line, just under its own proper Rank, *viz.* under 3, 4, and 2; then go to the last Row, where you find but 1, which you must put down also under the Line just under itself; and so the Numbers are added together; and you will find that they make 198 Feet in all, as by the *Example* following.

Hundreds	Tens	Units
1	2	0
	4	4
	3	4
1	9	8

Hundreds	Tens	Units
	3	4
	4	4
1	2	0
1	9	8

When any of the Ranks amount to Ten, or Tens, or they exceed Ten or Tens, then you must place a Cypher (if even Tens) under the Line in its proper Place; or else what is above Ten or Tens; and for every Ten carry a Unit, or One, to be added to the next Rank. *As for Example:* If the *Series*, or Row, amount just to Ten, I set down a Cypher under the Line in its Place, (for every Figure or Cypher must be sure to stand just under its own Rank) and carry one to the next Rank for the one Ten. So if any of the Rows come just to even Tens, as 20, 30, 40, &c. I set down a Cypher, and carry either two, three, or four, according to the Number of Tens. And when it happens, that any of the Ranks exceed Ten or Tens, then whatever the Excess is, set it down under the Line in its Place. As if it amounts to 45, set down 5, and carry 4, for the four Tens to the next Row. If to 72, set down 2, and carry 7, for the seven Tens, &c. And when you come to the last Row, set down what it amounts.

amounts to, let it be what it will. *Examples* follow, exemplifying the Directions above.

Add 26 *l.* 15 *l.* 20 *l.* and 45 *l.* together. Also 265 Ells, 354 Ells, 460 Ells, 375 Ells and 246 Ells together; which must be set down as underneath.

Pounds	Ells
26	265
15	354
20	460
45	375
	246
106	1700

Beginning at the lowermost Figure in the Place of Units, say, 5 and 5 is 10, and 6 is 16, which is 6 over one Ten, wherefore set down 6 under its own Rank, and carry 1 for the Ten to the next Rank, saying, 1 that you carry and 4 is 5, and 2 is seven, and 1 is 8, and 2 is 10, which being the last Row, set down 10, and the Work is done; and the Total of the four Numbers is 106 *l.* As in the *Example*.

So in the next *Example*, begin with the bottom Figure on the Right Hand, and say, 6 and 5 is 11, and 4 is 15, and 5 is 20; which being just 2 Tens, and nothing over, set down a 0, and carry 2 to the next Rank, for the 2 Tens, and say 2 that you carry and 4 is 6, and 7 is 13, and 6 is 19, and 5 is 24, and 6 is 30, which amounting just to 3 Tens, set down a 0 again, and carry 3 for the 3 Tens, saying, 3 that you carry, and 2 is 5, and 3 is 8, and 4 is 12, and 3 is 15, and 2 is 17, which being the last Row, set down 17, and the Total Sum is 1700 Ells; as may be seen in the *Example*.

The Reason for carrying One for every Ten, to the Left Hand is, because the Increase of every Place that Way, is by a ten-fold Proportion, as was said in *Numeration*.

Examples

Examples for Practice.

<i>Yards</i>	<i>Gallons</i>	<i>Pounds</i>
74	74	746
09	9	379
72 Or thus,	72	024
19	19	100
07	7	074
70	70	047
251	251	1370

Some chuse to omit the Cyphers on the Left Hand, as in the second *Example*; thinking it a little too precise; since Cyphers on the Left Hand signify nothing; but the other is best for a Learner, for his better Understanding the Value of the Places, &c.

More Examples.

<i>l.</i>	<i>Ells</i>	<i>l.</i>
71	742	7444
17	371	270
46	462	5000
64	072	500
20	971	6742
2	674	240
56	321	52
65	015	9
341	3628	20257

Here follow some familiar *Examples*, shewing the Nature, and Use of this Rule, viz.

Question

Question 1. Between *London* and *Royston* are 33 Miles; from thence to *Cambridge* 10; thence to *New-Market* 10; thence to *Bury* 10; thence to *Thetford* 10; thence to *Attleborough* 10: and from thence to *Norwich* 12 Miles: How many Miles are there between *London* and *Norwich*?

Set the Numbers down in the following Manner.

Miles.

33
10
10
10
10
10
12
—

Between *Lond.* and *Norwich* are 95 Miles.

Question 2. Again, how many Days are there in these 12 Calendar Months, or 1 Year?

	Days
January hath	31
February	28
March	31
April	30
May	31
June	30
July	31
August	31
September	30
October	31
November	30
December	31

Ans^w. 365

Question 3. Suppose a Farm contains these Acres in the several Fields following, &c.

In

	Acres.
In one Field — —	10
Another — —	15
Another — —	12
Another — —	20
Another — —	9
Another — —	6
And in another — —	22
	—
How many Acres in all?	94

Question 4. Admit a Draper measures 9 Pieces of Cloth, and their Contents are, viz.

N ^o	Yards.	
1 qt. — —	25	} How many Yards in all?
2 — —	12	
3 — —	25	
4 — —	10	
5 — —	9	
6 — —	16	
7 — —	10	
8 — —	20	
9 — —	8	
	—	
Answ. 135		

Note, That in setting down the Numbers, Care must be taken, not to place Units under the Place of Tens, but to put them properly, as in the 5th and last Article of the Sum above.

Question

Question 5. A Corn-Factor bought as follows, viz.

	grs.
Wheat	56
Oats	45
Peas	24
Rye	72
Barley	220

417 Quarters in all.

Question 6. A Ship from the Indies, whose Cargo is as follows, viz.

	l.
In Pepper	14280
Other Spices	9741
Diamonds	112579
Callicoes	47217
Muslins	74219
Drugs	11241

What is the Value of the Whole? l. 269277 Answer.

Question 7. What Number is that, from which if you subtract 18, the Remainder will be 24?

Ans. 42. For if you add 18 and 24 together, they make 42, the Number sought.

To prove ADDITION.

Begin at the Top, and cast it downwards, in the same Manner as you did upwards; and if the Figures or Cyphers of the Total prove the same as in casting upwards, the Work is right; otherwise they must be cast upwards and downwards till they do agree.

A D-

ADDITION of MONEY.

In *Addition* of several Denominations must be observed, how many of the smaller Name make one of the next greater: As how many *Farthings* make a *Penny*, how many *Pence* a *Shilling*, and how many *Shillings* a *Pound*. Therefore I shall place the several *Tables*, of *Money*, *Weight*, *Measure*, &c. before the *Examples*, they being necessary to be first known.

Note, 4 *Farthings* make one *Penny*, 12 *Pence* one *Shilling*, and 20 *Shillings* one *Pound*.

In a Pound Sterling, are $\left\{ \begin{array}{l} 20 \text{ Shillings.} \\ 240 \text{ Pence.} \\ 960 \text{ Farthings.} \end{array} \right.$

Note also, That in *Addition* of *English Money*, *l.* stands for *Pounds*, *s.* for *Shillings*, *d.* for *Pence*, *gr.* for *Farthings*: Because *Libra* signifies a *Pound*, *Solidus* a *Shilling*, *Denarius* a *Penny*, and *Quadrans* a *Farthing*.

But the best Way to set down *Farthings*, or Parts of a *Penny*, is

$\frac{1}{4}$ { A *Farthing*, or Quarter of a *Penny*.
 $\frac{1}{2}$ { A *Half-penny*, Half a *Penny*.
 $\frac{3}{4}$ { Three *Farthings*, Three Quarters of a *Penny*.

Example 1.

Suppose I owe to one Person, 5*l.* 4*s.* 6*d.* to another, 1*l.* 7*s.* 11*d.* 9*gr.* to another, 1*l.* 4*s.* 07*d.* 5*gr.*, to another, 7*s.* 08*d.* 4*gr.*, to another, 1*l.* 8*s.* 00*d.* 0*gr.*, and to another, 1*l.* 9*s.* 07*d.* 6*gr.*, how much do I owe to all these several Persons? To do this, these several Sums must be set down in such order, that *Pounds* may stand under *Pounds*, *Shillings* under *Shillings*, and *Pence* under *Pence*, with Distances between them as follows.

<i>l.</i>	<i>s.</i>	<i>d.</i>
5	04	6
7	11	9
4	07	5
7	08	4
8	00	0
9	07	6

In casting up this, and all other Sums in this Rule, you must remember, that for every 4 in the *Farthings*, you must carry 1 to the Pence, because 4 *Farthings* make a Penny; for every 12 in the Pence you must carry 1 to the Shillings, because 12 Pence make a Shilling; and for every 20 in the Shillings, you must carry 1 to the Pounds, because 20 Shillings make a Pound; and the Pounds must be cast up as Sums of one Denomination, for every 10, carrying 1 to the next Row. And in all Additions, whether of *Money*, *Weight*, or *Measure*, &c. that Denomination towards the Left Hand (which is the first in setting down, but the last in casting up) must be so cast up. The same being again set down with a Line drawn under it, appears thus;

<i>l.</i>	<i>s.</i>	<i>d.</i>
5	04	6
7	11	9
4	07	5
7	08	4
8	00	0
9	07	6
41	19	6

Begin at the smallest Denomination towards the right Hand, (as in all *Additions* we must, whether of *Money*, *Weight* or *Measure*) to wit, *Pence*, and say, 6 and 4 is 10, and 5 is 15, and 9 is 24, and 6 is 30; now 30 Pence is 2 Shillings and 6 Pence, wherefore I put down 6 Pence under its own Rank, and carry 2 for the two Shillings

Shillings to the Rank of Shillings, saying, 2 that I carry, and 7 is 9, and 8 is 17, and 7 is 24, and 11 is 35, and 4 is 39; now, 39 Shillings is one Pound 19 Shillings, wherefore I set down the 19s. under its own Rank, and carry the one Pound to the Pounds, saying, 1 that I carry, and 9 is 10, and 8 is 18, and 7 is 25, and 4 is 29, and 7 is 36, and 5 is 41; which being under the Title of Pounds, is forty-one Pounds; so the whole Sum is, 41l. 19s. 6d. as in the *Example* may be seen.

Addition of several Denominations, is proved in the same Manner as *Addition* of One, by casting it downwards; and if it agrees with the Sum when cast upwards, it is right.

There is another Way used in *Schools*; that is, to cast up all again, except the upper Line, and then that Total they add to the upper Line, and if it agree with the Sum first found, it is right. But this Way is not so practical in Matters of real Business; therefore I prefer the other before it.

For the readier dispatch in casting up the Pence, 'tis very necessary to have the following Tables by Heart

Pence.		s.	d.		Pence.		Pence.
20	} is	1	8	} Or, 12 times	1	} is	12
30		2	6		2		24
40		3	4		3		36
50		4	2		4		48
60		5	0		5		60
70		5	10		6		72
80		6	8		7		84
90		7	6		8		96
100		8	4		9		108
110		9	2		10		120
120		10	0		11		132
					12		144

Get these Tables by Heart, thus; 20d. is 1s. 8d.
30d. is 2s. 6d. &c.

Example 2

Example 2.

Bought by a Country Shop-keeper in London, viz.

	<i>l.</i>	<i>s.</i>	<i>d.</i>
<i>Linen Cloth</i> , to the value of — — — —	21	11	4
<i>Sugars</i> — — — —	7	10	0
<i>Tobaccoes</i> — — — —	16	14	2
<i>Woollen Cloths, and Stuffs</i> — — — —	37	10	0
<i>Fruit</i> — — — —	11	16	8
<i>Brandy, and Waters</i> — — — —	9	14	2
	104	16	4

How much did he lay out in all?

Beginning at the Pence, I say, 2 and 8 is 10, and 2 is 12, and 4 is 16; and 16*d.* is 1*s.* 4*d.* I set down the 4, and carry the Shilling to the next, the Place of Shillings, saying, 1 that I carry, and 4 is 5, (for I omit the tens of Shillings till I come to the Top) and 6 is 11, and 4 is 15, and 1 is 16; then I come downwards with the Tens, saying, 16 and 10 is 26, and 10 is 36, and 10 is 46, and 10 is 56, and 10 is 66, and 10 is 76 Shillings, which is 3*l.* 16*s.* I set down the 16 under the Place of Shillings, and carry the 3 Pounds to the Pounds, saying, 3 and 9 is 12, and 1 is 13, (for I go up but with one Row at a time) and 7 is 20, and 6 is 26, and 7 is 33, and 1 is 34; I set down 4 and carry 3, for the 3 Tens, (for the last Denomination must be cast up as Sums of one Denomination, for every 10 carrying 1, as was said before) and say, 3 that I carry and 1 is 4, and 3 is 7, and 1 is 8, and 2 is 10; which being the last Row, I set it down. So the whole Sum is 104*l.* 16*s.* 4*d.* as per the Example.

Example 3.

A Merchant, upon Ballancing of his Books, finds he has in Money, Debts, and Goods, *viz.*

	<i>l.</i>	<i>s.</i>	<i>d.</i>
In Cash	2000	00	0
In Cambricks	60	00	0
In Tobaccoes	47	16	6
By Henry Harper, owing	121	17	4
In Sugar	246	07	2
In Serges	70	11	0
By Voyage to Lisbon	724	06	7
In Indigo	370	12	0
By William Waxham	1000	00	0
In Cochineal	424	16	8
By the Ship, Rose	640	11	0
In Canary Wine	142	17	0
	5849	15	3

Example 4.

A Brewer's Clerk receives of several Persons as follows, *viz.*

	<i>l.</i>	<i>s.</i>	<i>d.</i>
Of Lawrence Lick-Spiggot	12	14	0
— Frank Froth	9	10	4
— Sam. Swigg	20	11	6
— Ben. Bumper	36	16	8
— Henry Here'st'ye	24	00	0
— Jack Stout	8	16	6

Received in all, *l.* 112 09 0

Example 5.

Example 5.

A Collector of Excise receives in

	<i>l.</i>	<i>s.</i>	<i>d.</i>
<i>Suffex</i> _____	1420	10	6
<i>Kent</i> _____	0974	11	2
<i>Surrey</i> _____	0641	17	4
<i>Hampshire</i> _____	1344	11	1
<i>Hertfordshire</i> _____	0741	17	4
<i>Bucks</i> _____	0617	10	0
Total	5740	17	5

Example 6.

Sold by a <i>Hofier</i> ,	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>q.</i>
4 <i>pr.</i> Silk Stockings, at _____	2	10	6	$\frac{1}{2}$
7 <i>pr.</i> Worsted ditto, at _____	1	15	2	$\frac{1}{4}$
9 <i>pr.</i> Thread Hose, at _____	0	18	3	$\frac{3}{4}$
12 <i>pr.</i> Childrens, at _____	2	07	6	$\frac{1}{2}$
3 <i>yd.</i> Flannel, at _____	0	02	7	$\frac{1}{4}$
6 <i>pr.</i> Mill'd Hose, at _____	1	04	6	$\frac{3}{4}$
In all,	8	18	9	

Here I begin with the Farthings, saying, 3 and 1 is 4, and 2 is 6, and 3 is 9, and 1 is 10, and 2 is 12, which is Three-pence, which I carry to the Pence, &c.

Sometimes Sums are *Express'd* one Way, and *Set* down another, *viz.*

Example 7.

		<i>Expressed.</i>	<i>Set down.</i>		
			<i>l.</i>	<i>s.</i>	<i>d.</i>
For	{ Coals, Six and Thirty Shillings —		1	16	0
	{ Cloth, Seven and Fifty Shillings —		2	17	0
			<i>Sum,</i> 4	13	0

Example 8.

				<i>l.</i>	<i>s.</i>	<i>d.</i>
A Guinea	—	—	—	1	02	9
A Mark	—	—	—	0	13	4
An Angel	—	—	—	0	10	0
A Noble	—	—	—	0	06	8
A Crown	—	—	—	0	05	0
A Half-Crown	—	—	—	0	02	6
				Total,	3	00 3

Example 9.

		<i>Expressed.</i>		<i>Set down.</i>		
				<i>s.</i>	<i>d.</i>	<i>q.</i>
Mutton, Eight Groats	—	—	—	2	8	
Onions, Seven Farthings	—	—	—	0	1	$\frac{1}{4}$
Tobacco, Two and Twenty Pence	—	—	—	1	10	
Wine, Fifteen Pence	—	—	—	1	3	
Thread, Three Half Pence	—	—	—	0	1	$\frac{1}{2}$
Soap, Nineteen Pence	—	—	—	1	7	
Veal, Eleven Groats and Two-pence	—	—	—	3	10	
				Sum,	11	5 $\frac{1}{4}$

Tho'

Tho' when some of these Sums are to stand alone, and not in Order of *Pounds, Shillings* and *Pence*; as in a Letter, &c. 'tis better to set them down as spoken; As 15 *d.* 45 *s.* &c. rather than 1 *s.* 3 *d.* 2 *l.* 5 *s.* &c.

Note, That in setting down your Sums, Care must be taken that you do not set down more or so much in the Place of a lesser Denomination, than makes one of the next greater: For it would be absurd to write down 18 *l.* 22 *s.* 15 *d.* for 19 *l.* 3 *s.* 3 *d.* Or, 15 *C.* 39. 29 *lb.* for 16 *C.* 09. 1 *lb.*

Some used formerly, (and some of weak Heads do now) to make a *Point* or *Stop*, at every four in the Farthings; at every 12 in the Pence; at every 20 in the Shillings; and at every 10 in the Pounds; if they consist of several Ranks, carrying so many Ones, as they find Points or Specks in one Denomination, to the next: But this Way is both tedious and slovenly. But if your Sums are very large, you may make a Stop at every 60, in the Pence, for 5 *s.* and carry accordingly to the Shillings; and for the Units-Rank in Shillings, cast them up as Sums of one Denomination, for every Ten carrying One to the Tens of Shillings, and reckon them as so many Ones; and when you come up to the Top, halve them, which Half, carry to the Pounds; but if they halve not even, set down the odd One in the Ten's Place of *Shillings*, &c. Examples of which you will find in the following Page.

Whenever there is a Necessity to *Point* or *Stop*, do it rather upon your Nail, or on a Bit of Paper, than in your Book, or Paper where the Sum is; because, in proving it, the Points very rarely happen in the same Place; and the many Stops may be apt to confound you, and also make the Work appear foul.

Example 10.

<i>l.</i>	<i>s.</i>	<i>d.</i>
16	17*	10
47	11	6.
74	06	9
54	19	7
45	09	8
72	14	5
27	04	3
16	07*	9
61	17	8
24	06	7.
42	17	5
24	19	7
47	11	5
74	01	9
41	00	7
36	17	5
47	17	9
20	10	11
777	12	10

Example 11.

<i>l.</i>	<i>s.</i>	<i>d.</i>
714	19	6
412	10	7
374	11	9
241	14	5
474	16	4
372	12	6
330	12	9
200	07*	9.
472	12	7
521	09	6
245	17	8
324	12	2
725	15	4
317	13	9
972	14	5
321	15	7
733	17	3
245	11	1
8004	04	11

Here, in the 10th *Example*, I begin at the bottom, saying thus, 11 and 9 is 20, &c. till I come to the Article 24*l.* 6*s.* 7*d.* where the Figures amount to 65, where I make a *Point* or *Stop*, for 5*s.* and carry 5 to the next Figure over it, saying, 5 and 8 is 13, &c. till I come to the Article 47*l.* 11*s.* 6*d.* where it amounts to just 60: and there I make another *Point* for 5*s.* more; and for the odd 10*d.* I set it down in its Place, and carry the two 5's making 10, to the Shillings, saying, 10 and 7 is 17, and 7 is 24, &c. till I come to the Top, where it amounts to 102; wherefore I set down 2, and carry 10 to the Tens of Shillings; saying, 10 and 1 is 11, &c. And

And at the Top it comes to 21, the Half of which is 10, and 1 over, which I place on the Left Hand of the 2, and it makes 12s. and I carry the 10 to the Pounds, saying, 10 and 7 is 17, and 6 is 23, &c. casting the Pounds up as Sums of one Denomination; and the Total is 777*l.* 12*s.* 10*d.* As in the *Example* may be seen.

Or the *Shillings* may be cast up by *Pointing* at every 60, and 40, in the Unit Rank of *Shillings*, which make 5*l.* As at the Articles, *l.* 16-07-9* and *l.* 16-17-10* or uppermost Number, where a small *Asterism* is placed, to denote it accordingly. At the Top it comes to 42; I set down 2 and carry 5*l.* to the Tens of *Shillings*, taking two of them as I go up, for 1*l.* saying, 5 I carry, and 1 is 6, and 1 is 7, &c.

AVOIRDupois-WEIGHT.

By this Weight is weighed all Kind of Grocery Wares; or Goods subject to waste; as *Tobacco*, *Sugar*, *Fruit*, *Drugs*, *Butter*, *Cheese*, *Allom*, *Iron*, *Brass*, *Lead*, *Soap*, *Tallow*, *Pitch*, *Rozen*, *Tin*, *Salt*, *Wax*, *Flax*, *Hemp*, and all Kinds of Garble Goods, &c.

A Table of Avoirdupois-Weight.

			Marks.
16 Drams	} make	1 Ounce	{ oz. lb. qu. C. T.
16 Ounces		1 Pound	
28 Pounds		1 Quart. of a Hund.	
4 Quarters		1 Hundred	
20 Hundred		1 Tun	

** Note, A Pound Avoirdupois-Weight, is equal to 14 Ounces 12 penny-Weight, Troy.

In a Tun Weight are,

573440 *Drams*

35840 *Ounces*

2240 *Pounds*

80 *Quarters*

20 *Hundred Weight, of 112lb, each.*

AVOIRDUPOIS Great Weight.

Examples.

(10)	(20)	(4)	(28)	(10)	(20)	(4)	(28)
<i>Tuns.</i>	<i>C.</i>	<i>gr.</i>	<i>lb.</i>	<i>Tuns.</i>	<i>C.</i>	<i>gr.</i>	<i>lb.</i>
7	14	3	12	7	11	1	12
5	19	1	06	6	07	2	15
9	07	1	00	7	09	1	17
7	07	2	12	4	15	1	06
2	15	0	20	6	07	1	14
9	17	3	21	2	17	0	19
43	02	20	15	35	08	0	27

Here you must begin at the least Denomination towards the right Hand (as before in Money) *viz.* Pounds; saying, 21 and 10 is 31, (taking but one 10 in the 20, for the easier reckoning) which is 3 above 28; make a *Point* on your Nail for the Quarter, and say, 3 and 10 that was left in the 20, is 13, and 12 is 25, and 6 is 31; make another *Point*, and say 3 and 12 is 15, which set down under its own Rank; and for the two *Points*, or *Stops*, made for the Quarters, carry 2 to the Quarters, saying, 2 and 3 is 5, and 2 is 7, and 1 is 8, and 1 is 9, and 3 is 12; now 12 Quarters, is just 3 *C.* wherefore set down 0, and carry 3 to the Hundreds; and

and proceed as in *Money*, (20 *C.* making a *Tun*, as 20 *s.* did a Pound) saying, 3 and 7 is 10, and 5 is 15, and 7 is 22, and 7 is 29, and 9 is 38, and 4 is 42; and coming down with the Tens, say, and 10 is 52, and 10 is 62, and 10 is 72, and 10 is 82, which is 4 *Tuns*, and 2 *C.* over; which I set down, and carry 4 to the *Tuns*, saying, 4 and 9 is 13, and 2 is 15, and 7 is 22, and 9 is 31, and 5 is 36, and 7 is 43; and so the Sum is finished, the Total being 43 *Tuns*, 02 *C.* 0 *qr.* and 15 *lb.* As in the *Example* may be seen.

The Figures over the Title of each respective Denomination, shew what you must stop or point at, and are distinguished thus; (10) (20) (4) and (28)

More Examples for Practice.

(10)	(20)	(4)	(28)	(10)	(20)	(4)	(28)
<i>Tuns</i>	<i>C.</i>	<i>qr.</i>	<i>lb.</i>	<i>Tuns</i>	<i>C.</i>	<i>qr.</i>	<i>lb.</i>
74	13	0	15	74	14	1	16
46	11	1	17	41	06	1	11
44	09	2	06	24	15	2	07
74	19	3	16	19	06	3	15
44	07	0	21	26	14	1	07
74	14	1	15	14	12	2	15
359	15	2	06	201	10	0	15

Twelve

28

3

84

28

2

56

27

83

Twelve Hogsheads of Tobacco, containing, viz.

No.	C.	qr.	lb.	No.	C.	qr.	lb.	Tare.
1	7	3	12	7	5	1	24	90
2	4	1	17	8	4	2	19	94
3	9	0	24	9	4	3	23	99
4	6	3	26	10	3	3	21	84
5	5	1	17	11	4	1	23	79
6	4	2	20	12	4	3	24	96
38 2 04				28 1 22 542				

71	1	19
47	3	24
57	2	16
71	0	21
47	1	12
51	2	06
347	0	14

46	1	19
24	3	03
23	0	21
67	2	13
27	1	17
34	3	23
224	1	12

AVOIRDUPOIS Small Weight.

This is in use chiefly for *Silk*, as among *Stocking-makers*, *Weavers*, &c. they delivering their *Silk*, out and in, by *Pounds*, *Ounces*, and *Drams*.

Examples.

Examples.

(16) (16)			(16) (16)		
lb.	oz.	qr.	lb.	oz.	qr.
4	10	06	4	11	14
7	14	12	2	13	12
5	07	04	7	10	15
9	14	15	4	07	14
4	05	07	6	09	06
6	11	14	4	07	10
39	00	10	30	13	07

But in weighing *Worsted*, and some other Things, it is usual to go no lower than a quarter of an Ounce, as in these *Examples*.

(16) (4)			(16) (4)		
lb.	oz.	dr.	lb.	oz.	dr.
4	13	1	9	07	2
7	12	2	7	10	1
9	11	3	8	15	3
7	04	2	7	12	2
4	13	1	3	13	3
34	07	1	37	11	3

Wool is also weighed by *Avoirdupois* Weight, but differently divided, according to the following Table, viz.

Note,

Note, that $\left\{ \begin{array}{l} 7 \text{ Pounds is one Clove} \\ 2 \text{ Cloves, one Stone} \\ 2 \text{ Stone, one Tod} \\ 6\frac{1}{2} \text{ Tod, one Wey} \\ 2 \text{ Weys, one Sack} \\ 12 \text{ Sacks, one Last} \end{array} \right\}$ or $\left\{ \begin{array}{l} \text{lb.} \\ 14 \\ 28 \\ 182 \\ 364 \\ 4368 \end{array} \right.$

And in a *Last of Wool*, are $\left\{ \begin{array}{l} 4368 \text{ Pounds} \\ 624 \text{ Cloves} \\ 312 \text{ Stone} \\ 156 \text{ Tod} \\ 24 \text{ Weys} \\ 12 \text{ Sacks.} \end{array} \right.$

Note, That the Wey differs in some Counties; as in *Suffolk*, the Wey is 336 lb. or 42 Cloves; in *Essex*, 256, or 32 Cloves; and according to the Division above; 182 lb.

TROY WEIGHT.

By this Weight are weighed *Jewels, Gold, Silver, Pearl, Electuaries, and Liquors*. A Pint of *Water, Wine, &c.* being a Pound. And the usual Denominations are *Pounds, Ounces, Penny-Weights, and Grains*; as in the following Table.

Note, $\left\{ \begin{array}{l} 24 \text{ Grains} \\ 20 \text{ Penny Weight} \\ 12 \text{ Ounces} \end{array} \right\}$ make $\left\{ \begin{array}{l} 1 \text{ Penny Weight} \\ 1 \text{ Ounce} \\ 1 \text{ Pound} \end{array} \right.$

In a Pound Troy, are $\left\{ \begin{array}{l} 5760 \text{ Grains} \\ 240 \text{ Penny Weight} \\ 12 \text{ Ounces} \end{array} \right.$

25 lb. 1 Quarter of a Hundred.
100 lb. 1 Hundred Weight.
20 Hundred 1 Tun of Gold or Silver.

The

The Value of Gold.

The Value of Silver.

	<i>l.</i>	<i>s.</i>	<i>d.</i>		<i>l.</i>	<i>s.</i>	<i>d.</i>
Pound Wt. is worth	48	0	0	1 Pound Wt.	3	2	0
Ounce	4	0	0	1 Ounce	0	5	2
Penny-Weight	0	4	0	1 Penny Wt.	0	0	3 $\frac{1}{16}$
Grain	0	0	2	1 Grain, $\frac{1}{2}$ a Farthing.			

A Tun of Gold at 4*l.* the Ounce, *l.* 96000.

A Tun of Silver at 5*s.* the Ounce, *l.* 6000.

Examples of Troy-Weight.

	(12)	(20)	(24)
<i>l.</i>	<i>oz.</i>	<i>dwt.</i>	<i>gr.</i>
5	10	12	20
5	04	06	13
7	07	07	06
5	04	19	14
4	11	04	14
6	04	17	21
35	07	08	16

	(12)	(20)	(24)
<i>l.</i>	<i>oz.</i>	<i>dwt.</i>	<i>gr.</i>
5	10	10	11
4	11	17	19
6	10	01	10
5	06	14	15
4	10	14	17
2	05	04	08
30	07	03	08

	(12)	(20)	(24)
<i>oz.</i>	<i>dwt.</i>	<i>gr.</i>	
24	13	10	
19	11	15	
07	04	14	
21	13	16	
11	05	23	
08	04	12	
14	07	10	
15	10	11	
122	11	15	

	(12)	(20)	(24)
<i>oz.</i>	<i>dwt.</i>	<i>gr.</i>	
105	10	05	
217	06	08	
360	03	06	
195	11	07	
217	02	09	
196	02	08	
321	07	05	
172	08	11	
1785	11	11	

Here

Here is no Occasion for Pointing, but only in the Grains: But if you do stop at more, only mind the Figures over the Titles, as before in *Avoirdupois Weight*, and they direct at what to Point.

Note, A Pound *Troy* is about 13 Ounces, 2 Drams and a half *Avoirdupois*; or as 17 to 14; and the Ounce *Troy*, as 51 to 56.

			<i>l.</i>	<i>s.</i>	<i>d.</i>
A Pound <i>Troy</i> of Gold	}	is worth	48	00	0
A Pound <i>Avoirdupois</i> of Gold			58	08	0
A Pound <i>Troy</i> of Silver	}	is worth	03	03	0
A Pound <i>Avoirdupois</i> of Silver			03	15	3

		<i>lb.</i>	<i>oz.</i>	
100 <i>l.</i> in Gold, weighs	}	1	11	{ <i>Avoirdupois</i>
100 <i>l.</i> in Silver, weighs		26	04	

A Pound *Avoirdupois* is heavier than a Pound *Troy*; but the Ounce *Avoirdupois* is lighter than the Ounce *Troy*; for the Ounce *Troy* weighs 480 Grains, but the Ounce *Avoirdupois* but 438 Grains.

APOTHECARIES WEIGHT.

Apothecaries have their Weight deduced from *Troy*; their Pound being the same, to wit, 12 Ounces; but differently divided, as follows, *viz.*

				<i>Marks.</i>	
20 Grains	}	make	{	1 Scruple	3
3 Scruples				1 Dram	3
8 Drams				1 Ounce	3
12 Ounces				1 Pound	lb

By these Weights *Apothecaries* compound their Medicines; but they buy and sell their Drugs by *Avoirdupois* Weight.

Examples

Examples.

	(12)	(8)	(3)	(20)		(10)	(12)	(8)	(3)	(20)
lb	3	3	3	gr.	lb	3	3	3	gr.	
4	10	7	2	19	48	07	1	1	17	
3	10	6	1	10	12	11	4	2	12	
2	09	5	0	06	24	09	7	1	07	
1	08	4	2	04	19	10	5	2	12	
1	06	3	1	12	34	06	6	0	00	
1	00	0	0	00	24	04	4	1	15	
15	10	3	2	11	165	00	6	1	03	

In a Pound are,
 5760 Grains
 288 Scruples
 96 Drams
 12 Ounces

CLOTH MEASURE.

Note, that $\left\{ \begin{array}{l} 4 \text{ Nails} \\ 4 \text{ Quarters} \\ 5 \text{ Quarters} \\ 3 \text{ Quarters} \end{array} \right\}$ make $\left\{ \begin{array}{l} 1 \text{ Quarter} \\ 1 \text{ Yard} \\ 1 \text{ Ell English} \\ 1 \text{ Ell Flemish} \end{array} \right\}$

$\left. \begin{array}{l} 3 \\ 4 \\ 5 \\ 6 \end{array} \right\}$ or $\left. \begin{array}{l} 12 \\ 16 \\ 20 \\ 24 \end{array} \right\}$ Nails. make $\left\{ \begin{array}{l} 1 \text{ Ell Flemish} \\ 1 \text{ Yard} \\ 1 \text{ Ell English} \\ 1 \text{ French Aulme, or Ell} \end{array} \right\}$

Examples.

Examples.

<i>Tds.</i>	<i>qrs.</i>	<i>Nls.</i>	<i>El.</i>	<i>Eng.</i>	<i>qrs.</i>	<i>Nls.</i>	<i>El.</i>	<i>Flem.</i>	<i>qrs.</i>	<i>Nls.</i>
(10)	(4)	(4)		(10)	(5)	(4)		(10)	(3)	(4)
14	1	3		24	3	3		25	2	3
21	2	2		17	4	1		36	1	2
56	1	0		46	2	2		42	2	3
42	2	3		27	1	0		54	2	1
17	0	2		34	4	3		61	1	2
24	1	2		51	2	2		72	2	3
176	1	3		202	3	3		294	1	2

LIQUID MEASURE.

Is of two Sorts; one for *Wine, Spirits, Oil, &c.*
And the other for *Ale and Beer.* The Tables of
which are as follow.

In WINE MEASURE.

231 Solid Inches,	}	make	1 Gallon
42 Gallons,			1 Tierce
63 Gallons, or 1 Tierce and $\frac{1}{2}$			1 Hoghead
2 Hogheads			1 Pipe, or Butt
2 Pipes or Butts,			1 Tun
84 Gallons,			1 Puncheon

By this you Measure all Wines, Brandies, Spirits,
strong Waters, Cyder, Perry, Mead, Oil and Honey.

In a Tun are,

- 2016 Pints
- 1008 Quarts
- 252 Gallons
- 14 Rundlets
- 6 Tierces
- 3 Puncheons
- 4 Hogheads
- 2 Pipes, or Butts.

Notes

Note, 18 Gallons is a Rundlet.

31½ Gallons is a *Wine*, or *Vinegar* Barrel.

A Tun weighs 18 C. *Avoirdupois*.

Note, Oil and Honey are measured by Wine-Measure.

Note, That *Sweet Oil* hath but 236 Gallons to the Tun, but *Whale-Oil*, or *Oil* from *Greenland*, hath 252 to the Tun.

In BEER MEASURE.

282 Solid Inches	} make	{	1 Gallon
9 Gallons			1 Firkin
2 Firkins			1 Kilderkin
2 Kilderkins			1 Barrel
1½ Barrel, or 54 Gallons.			1 Hoghead

Note, That in all other Places besides London, the Firkin of Beer and Ale contains 8½ Gallons.

In a Barrel of Beer are,

10152 Solid Inches

288 Pints

144 Quarts

72 Pottles

36 Gallons

4 Firkins

2 Kilderkins

Note, That 3 Barrels, or 108 Gallons, make 1 Butt of Beer.

ALE MEASURE.

82 Solid Inches	} make	{	1 Gallon
8 Gallons			1 Firkin of Ale,
			Soap, or Herrings
2 Firkins			1 Kilderkin
1½ Barrel, or 48 Gallons			1 Hoghead

In

In a Barrel of *Ale* are,
 9024 Solid Inches
 256 Pints
 128 Quarts
 64 Pottles
 32 Gallons
 4 Firkins
 2 Kilderkins

The *Beer* and *Ale* Gallons are the same, viz. 28 solid Inches, but with this Difference, *i. e.* the Barrel of *Beer* contains 1128 Cubick Inches more than the Barrel of *Ale*, that is, 4 Gallons.

Examples of Wine Measure.

(10) Tuns.	(4) Hds.	(63) Gal.	(8) Pints.	(10) Tuns.	(4) Hds.	(63) Gal.	(8) Pints.
71	2	19	4	75	2	24	7
24	1	27	6	44	1	17	2
12	2	56	4	27	1	46	6
42	0	37	7	29	1	19	4
15	3	60	2	24	3	46	4
166	3	12	7	201	2	28	7

DRY MEASURE.

By this are measured, all sorts of Grain, Salt, Sea Coal, &c.

Note, that	2 Pints	Make	1 Quart
	2 Quarts		1 Pottle
	2 Pottles		1 Gallon
	2 Gallons		1 Peck
	4 Pecks		1 Bushel
	8 Bushels		1 Quarter, or 2 Comb
	4 Quarters		1 Chaldron
	5 Quarters		1 Wey
	2 Weys		1 Laft

Note,

Note, Four Pecks is one Bushel Land-Measure; and 5 Pecks one Bushel Water-Measure.

Observe likewise, That when Salt and Sea-Coal are measured by the Corn-measure, they are heaped; or else there are 5 striked Pecks to the Bushel; and 36 Bushels in a Chaldron of Coals; there being 21 Chaldrons to the Score, in the River of *Thames*.

A Gallon contains $268\frac{4}{5}$ Cubick Inches; and a Bushel of Corn, $2150\frac{2}{3}$ Cubick Inches.

Note, A Bushel ought to be $18\frac{1}{2}$ Inches wide, and 8 Inches deep, as by Act of Parliament in 1697.

Some make 6 Quarters of Meal a Wey; and 1 Wey 3 Quarters, a Last.

Examples of Dry Measure.

(10)	(8)	(4)	(2)
Qu.	Bush.	Peck.	Gal.
24	6	2	1
17	3	2	0
20	7	1	1
15	5	0	1
21	2	1	1
19	4	2	0
19	5	2	0

(10)	(4)	(8)	(4)
Ch.	Qu.	Bush.	Pecks.
174	3	6	3
241	1	7	2
296	2	4	3
171	1	5	0
097	0	5	2
471	2	4	3
1453	1	2	1

LONG

LONG MEASURE.

Note,	{	3 Barley-Corns make one Inch
		12 Inches one Foot
		3 Foot one Yard
		3 Foot 9 Inches, one Ell <i>English</i>
		2 Yards, or 6 Foot, one Fathom
		5 Yards $\frac{1}{2}$, or 16 Foot and $\frac{1}{2}$, one Pole
		40 Square Poles, or 220 Yards, one Furlong
		8 Furlongs, or 1760 Yards, one Mile
		3 Miles one League
		20 Leagues, or 60 Miles, 1 Degree
		360 Degrees, or 21600 Miles, is supposed to be the Circumference of the Earth and Sea.

Note, That an *English* Mile, is 286 Feet less than an *Italian* Mile. And that 5 Foot is a Geometrical Pace.

In a Mile are,
 190080 Barley-Corns
 63360 Inches
 5280 Feet
 1760 Yards
 320 Poles
 8 Furlongs
 80 Chains
 1056 Paces
 1408 Ells
 8000 Links of the Chain.

Example

Example in Long Measure.

(10) Miles.	(8) Furl.	(40) Poles.	(10) Miles.	(8) Furl.	(40) Poles.
24	6	22	37	4	21
37	5	26	20	3	17
15	4	34	42	5	19
74	3	39	31	6	27
41	7	24	52	4	19
194	4	25	185	0	23

From the preceding Table of *Long Measure*, is deduced this of *Land Measure*, viz.

Forty Poles (or Perches) in Length, and 4 in Breadth, make an Acre, or 160 square Perches. Or 4840 square Yards make an Acre, or 43560 square Feet.

A *Hide* of Land is 100 Acres; 40 square Poles make a Rood, and 4 Roods an Acre.

Note, The Pole or Perch, of 16 Foot $\frac{1}{2}$ is *Statute-Measure*; but there are some customary Measures which are more; as for Fens and Wood Lands, there are reckoned 18 Foot to the Pole; and for Forests, 21 Foot to the Pole.

Examples.

(10) Acres.	(4) Roods.	(40) Poles.	(10) Acres.	(4) Roods.	(40) Poles.
14	2	24	74	2	27
26	3	29	61	1	20
17	1	19	20	2	36
26	2	20	14	3	11
36	2	36	37	1	10
24	1	12	27	2	34
146	2	20	236	2	18

T I M E.

T I M E,

Is measured by Years, Months, Weeks, Days, Hours, Minutes; as in the Table following.

Marked

60" Seconds	} Make	1 Minute	In a Year are 31557600 Sec.
60' Minutes		1 Hour	525960 Min.
24 Hours		1 Day natural	8766 Hrs.
7 Days		1 Week	365 Dys.
4 Weeks		1 Month	52 Wks.
13 Months, 1 Day, and 6 Hours		1 Solar Year	

A *Century* is 100 Years; an *Indiction* among the *Romans*, a Revolution of 15 Years.

Of the Motion of the Heavenly Bodies.

60" Seconds	} Make	1 Minute	
60' Minutes, or Miles		1 Degree	
30 Degrees		1 Sign	
62 Signs, or 360 Deg.		1 Revolution of the whole Sphere, or 360 Degrees.	

D O Z E N S.

There are several Commodities sold by the Dozen, a Table of which follows, *viz.*

In a great Gros are	1728 Pieces or Things
	144 Dozens
	12 Small Gros.

S Q U A R E

Square Measure.

16 Quarters of an Inch	}	make	one Inch
44 Inches			one Foot
9 Foot			one Yard
30 Yards $\frac{1}{2}$, or $272\frac{1}{4}$ square Feet			one Pole
30 Poles long, and 1 broad			one Rood
4 Roods			one Acre
60 Acres			one Mile

In a square Acre are 4 square Roods, 160 square Poles, &c. and in a square Pole, 30 square Yards $\frac{1}{4}$

In a square Mile are
 4014489600 Inches
 27878400 Feet
 3097600 Yards
 102400 Poles
 3560 Roods
 640 Acres

Some other Things necessary to be known, and of Use in Arithmetick.

Of F I S H.

120 of Ling, Cod, or Haberdine, to the 100, viz.

120	}	accounted	{	100
1200				1000, or a Barrel
10000				A Last, or 12 Barrels

Paper and Parchment.

1 Bale is 5 Bundles; 1 Bundle, 2 Reams; 1 Ream, 20 Quires, 1 Quire, 24 (or 25) Sheets. 1 Roll of Parchment, 5 Dozen; 1 Dozen, 12 Skins.

Of W O O D.

A Cord of Wood is 4 Foot over, 4 Foot deep, and 8 Foot long, being 128 Cubick Feet. A Stack of Wood is 3 Foot over, 3 Foot deep, and 12 Foot long, being 108 Cubick Feet.

Block Wood, being great Logs, are sold by the Cord and small by the Stack. A Cubick Foot is 1728 Cubick Inches. A Cubick Yard, 27 Cubick Feet, 4665 Inches. 4 Inches is a Hand in measuring a Horse. 2 Foot is one Pace. 4 Poles, or 100 Links, 1 Chain. 125 Geometrical Paces 1 Stade. 8 Stades an *Italian* Mile. 4000 Geometrical Paces a small *German* Mile and 5000 a Great. 160 Perches in Length, and 1 in Breadth; or 80 in Length and 2 in Breadth; or 40 in Length, and 4 in Breadth make an Acre of Land. 10 Foot every way is a Square; that is, 100 square Feet. A Faggot of Steel, 120lb. A burthen of Gun Steel, 9 Score, or 180lb. A Sack of Coals, 3 Bushels *Scots* Coals, 112lb. to the C. A Load of Timber 1000 Foot, a Tun 40. A Load of Hay 36 Trusses, and 1000 Pound the Truss; or 4 Stone, at 14 Pound the Stone but new Hay ought to be 60 Pound the Truss. 5000 Bricks a Load; and 1000 plain Tiles the same. 3000 Bushels of Lime 1 C. A Brick ought to be 9 Inches long, 4½ broad, and 2½ thick. A Tun of Train Oil 252 Gallons; a Tun of Sweet Oil 236 Gallons. Raw Silk (except *China*) is 24 Ounces to the Pound. A Tun of Lead, called a Fodder 19½ C. A Gallon of wheaten Meal weighs 7 Pound *Avoirdupois*. A Dick of Hides, or Skins, are 10; and 20 Dickers a Last. A Stone of Glas is 5 Pound; a Seam of Glas is 24 Stone. 40 Skins make a Timber of Sables, Martins, Mink Jennits, Fitches and Greys. 120 to the Hundred, a Coney, Kid, Lamb, Budge, and Cat-Skins; 50 to the Kip of Goat-Skins; and 13 tann'd Calf Skins a Dozen.



C H A P. III.

S U B T R A C T I O N,

IS the taking of a lesser Number, or Sum, out of a greater, thereby to find the Remainder, or Difference, between the said two Numbers; as if you take 3 from 19, the Remainder or Difference is 6.

Subtraction is of one Denomination, or of divers.

Of one, when the two Numbers are both of one kind, that is, both Yards, Gallons, Pounds, &c.

Of divers, when the two Sums consist of Pounds, Shillings, and Pence; or Tuns, Hundreds, Quarters, and Pounds, &c.

Subtraction is just the Reverse of *Addition*; for that puts Numbers together, but *this* takes Numbers from each other.

In setting down Numbers for Work, you must always place the greater Number or Sum uppermost; and in such Order, that Units may stand under Units, Tens under Tens, Hundreds under Hundreds, &c. as before in *Addition*.

A General Rule.

Whatever you stop at in *Addition*, the same you must borrow in *Subtraction*, when Need requires, remembering always to pay it to the next Figure towards the Left Hand.

Example 1.

Suppose I would know the Difference between 453 Yards bought, and 232 Yards sold.

I fet them down as underneath, and as before recited viz.

	<i>Yards.</i>	
<i>Bought</i>	453	Great Number
<i>Sold</i>	232	The Lesser
<i>Differ.</i>	221	Remains unfold
	453	Proof

After I have drawn a Line under the Sum, I begin at the first Figure towards the Right Hand, (as in *Addition*) and say, 2 from 3 (the Figure just over it) and there remains 1, setting it in its proper Place under the Line; and then go to the next Figure, saying, 3 from 5, and there remains 2, which I also put under the Line; and then to the last Figure, saying, 2 from 4, and there remains 2, and the Work is done; and I find the Remainder of Yards unfold to be 221; or that 453 is 221 more than 232; to prove the Truth of which I add the Remainder, or Difference, to the lesser Number, and if the two put together, make the greater or upper Number, the Sum is right, otherwise not; wherefore I say, 1 and 2 is 3, and 2 and 3 is 5, and 2 and 2 is 4, which are the same Figures with the upper or greater Number. Wherefore I know the Work is right, as may be seen in the *Example*. And by this way are all Sums of one Denomination proved in this Rule.

Example 2.

Let it be required to find the Difference between 756 Gallons received, and 444 Gallons delivered. To do which

which, I set the Numbers, the one under the other, as before directed, and they stand thus.

$$\begin{array}{r}
 \text{Gall.} \\
 756 \text{ Greater} \\
 444 \text{ Lesser} \\
 \hline
 312 \text{ Rem.} \\
 \hline
 756 \text{ Proof} \\
 \hline
 \end{array}$$

Then having drawn a Line under them, I begin and say, 4 from 6, and there rests 2; and 4 from 5 and there remains 1; and 4 from 7, and there remains 3: So the Work being done, I find the Difference to be 312; or so many Gallons remaining. And it is proved by *Addition*, as before; as may be seen by the Work above.

When any one of the under Figures is greater than the Figure over it, then you must borrow 10 [as you carried 10 in *Addition*] and put it to the Figure from whence you were to subtract, and then take it from their Sum, paying 1 for the said 10 borrowed, to the next Figure towards the left Hand in the lower Line.

Example 3.

I would subtract 496 Pounds paid, from 654 Pounds lent, viz.

$$\begin{array}{r}
 \text{L.} \\
 \text{Lent } 654 \text{ Greater} \\
 \text{Paid } 496 \text{ Lesser} \\
 \hline
 158 \text{ Rests due} \\
 \hline
 654 \text{ Proof} \\
 \hline
 \end{array}$$

Having set down the Numbers, as before directed, with a Line under them, I say, 6 from 4 I cannot, C 3 (but

(but putting 10 to the said 4, it is made 14) 6 from 14, and there remains 8, which I set down under the Line, then I say, 1 that I borrowed and 9 (the next Figure) is 10, from 5 I cannot, but 10 from 15, (adding 10 to the 5) and there rests 5, which also set down; then, 1 that I borrowed and 4 is 5, from 6, and there remains 1. The Sum being thus finished, I find that there remains due, or unpaid, 158 Pounds, which is proved by *Addition* as before.

Example 4.

Suppose there is advanced on a *Subsidy*.

	<i>L.</i>
	636420
Paid off	<u>47294</u>
Remainder	589126
Proof	<u>636420</u>

How much remains?

Here I say, 4 from 0 I can't, but 4 from 10, and there remains 6; 1 that I borrowed and 9 is 10 from 2 I can't, but 10 from 12 and there rests 2; then 1 that I borrowed and 2 is 3, from 4, and there remains 1; (here I borrow none, so must not pay any thing to the next Figure) then 7 from 6 I cannot, but 7 from 16, and there remains 9; 1 that I borrowed and 4 is 5, from 3 I cannot, but 5 from 13, and there remains 8; and now because there is no Figure standing under the 6, to carry the 1 borrowed to, I suppose a 0 to be placed there, and say, 1 that I borrowed, and 0 is 1, from 6, and there remains 5; and so the Work is done, and the remainder is 589126*l.* as in the *Example*.

More

More Examples for Practice.

	<i>l.</i>		<i>Ells.</i>
Borrowed	14075	Bought	74000
Paid	08424	Sold	29460
Rest due	5651	Rest unfold	44540
Proof	14075	Proof	74000

	<i>Sheep.</i>		
Received	492	Advanced	47692
Delivered	397	Paid off	29767
Remains	95	Remains	17925
Proof	492	Proof	47692

Some Questions proper to this Rule, shewing its Nature and Use.

<i>Quest. 1.</i> What is the Difference between a Piece of Timber containing 56 Feet, and another Piece of 29 Foot?	<i>Feet.</i>
	56
	29
<i>Ans.</i>	27

<i>Quest. 2.</i> A Man borrowed <i>l.</i> 96 and paid 58, what remains due?	58
<i>Ans.</i>	38

Quest. 3. If a Person hath 150 Miles to travel, and hath gone 99 Miles, how many Miles hath he yet to go?

Miles.

150

99

Ans. 51

*From 100 Pounds borrowed, take 72 paid; -
 'Twas a Virgin that lent it, what's due to the Maid?*

Ans. l. 28

Quest. 4. If a Person be 48 Years of Age, this present Year, what Year was he born in?

Years

1775

48

 1727

Quest. 5. How many Years since the *Spanish* Invasion, it being in the Year 1588?

Greater Number 1775

Lesser Number 1588

Years since 187

*From 90 take 30, from 40 take 10;
 Subtract 6 from 60, and what remains then?*

Ans. 144

Quest. 6.

and
80? *Quest. 6.* What Number must be put to 297 l. to make it 730?

$$\begin{array}{r} 730 \\ 297 \\ \hline \text{Answ. } 433 \\ \hline \text{Proof } 730 \\ \hline \end{array}$$

id? *In fifteen hundred ninety-two there dy'd a noble Prince, How many Years is it ago, that is, how many since?*

$$\begin{array}{r} 1775 \\ 1592 \\ \hline \text{Answ. } 183 \\ \hline \end{array}$$

75
88
—
87
—
Quest. 7. What 5 Numbers and all different, will make just 65?

va- To do this, set down four different Numbers at random, observing that they do not amount to the Number proposed: and add them together, and subtract that Total from the Number proposed, and the Remainder will be the 5th Number, to make the other Numbers 65, as in the following

Example.

65 The Number proposed

$\left. \begin{array}{l} 12 \\ 13 \\ 9 \\ 16 \end{array} \right\}$ The four Numbers set down at Random.

50 Total

15 The 5th Number

C 5

And

And so of any other Number proposed to be made up by different Numbers, let them be 5, 6, 7, &c. Remember always, that the Random Numbers be less than the Numbers proposed to make up the Number assigned.

Of MONEY.

When the Sums to be subtracted are of divers Denominations, whether they be *Money*, *Weight*, or *Measure*, the same Method must be observed in setting them down as in *Addition*; that is, the several Names must be set just under one another; as Pounds under Pounds, Shillings under Shillings, and Pence under Pence, &c. with Distances between them; always observing that the great Sum must be uppermost, as before in Sums of one Denomination. Then proceed to take the under Sum out of the uppermost, beginning at the least Denomination towards the Right Hand, as in *Addition*; and the same Respect must be had, when there is occasion to borrow, as before in *Addition*, observing how many of the lesser Denomination make one of the next greater and borrow accordingly; remembering always to pay what you borrow to the next Denomination.

Example.

I would subtract 247 *l.* 11 *s.* 9 *d.* $\frac{1}{2}$. *Disbursements* from 372 *l.* 11 *s.* 6 *d.* $\frac{1}{4}$. *Received*. To do which, set them down as before directed; and then they stand thus;

	<i>l.</i>	<i>s.</i>	<i>d.</i>	
Received	372	11	6 $\frac{1}{4}$	Greater
Disburs.	247	11	9 $\frac{1}{2}$	Lesser
Remains	124	19	8 $\frac{3}{4}$	
Proof	372	11	6 $\frac{1}{4}$	

I begin

I begin at the least Denomination towards the Right Hand, *viz.* Farthings, saying, 2 from 1 I cannot, wherefore I borrow one from the next Name which is Pence, one of which is 4 Farthings, but 2 from 4 and there remains 2, (which remainder always add to the upper Number, or Figure you subtract from, for the more easy reckoning) and the 1 Farthing over it makes $\frac{3}{4}$, which I place under the Line, and go to the next Denomination of Pence, saying, 1 that I borrowed and 9 is 10, from 6 Pence I cannot, but I borrow one of the next, which is Shillings, one of which is 12 Pence; but 10 Pence from 12 Pence, and there remains 2, which I put to the Figure 6 I subtract from, and it makes 8, which I also put under the Line, in its proper Place, and then I go to the next Denomination which is Shillings, saying, 1 that I borrowed and 11 is 12, from 11 Shillings I cannot, wherefore I borrow one of the next, which is Pounds, (one of which is 20 Shillings) but 12 from 20 and there remains 8, and the 11 Shillings over it, which I subtract from, is 19, which I place under the Line, in its place; then going to the Pounds, I say 1 that I borrowed, and 7 is 8, from 2 I cannot (here I borrow 10 as in Sums of one Denomination) but 8 from 12 and there remains 4, then 1 that I borrowed and 4 is 5, from 7 and there remains 2; and lastly, 2 from 3 and there remains 1: And so the Sum is finished, and the Remainder or Difference, 124 *l.* 19 *s.* 8 *d.* $\frac{3}{4}$, as by the *Example* may be seen.

Example.

A Collector of the *Excise* hath received 2479 *l.* 12 *s.* 6 *d.* $\frac{3}{4}$, and paid into the Office by several Remittances, 1977 *l.* 11 *s.* 2 *d.* How much remains in his Hands?

	<i>l.</i>	<i>s.</i>	<i>d.</i>
Received	2479	12	6 $\frac{3}{4}$
Paid	1977	11	2
Remains in his Hands	502	01	4 $\frac{3}{4}$
Proof	2479	12	6 $\frac{3}{4}$

Here

Here I begin and say, nothing from $\frac{3}{4}$, and there remains $\frac{3}{4}$; then 2 from 6, and there remains 4; and 11 from 12, and there remains 1; and then I go to the Pounds, saying, 7 from 9 and there remains 2; and 7 from 7, and there remains 0; and 9 from 4 I cannot, but 9 from 14 and there remains 5; and that I borrowed and 1 is 2, from 2 and there remains 0; and so the Sum is done; and he hath remaining in his Hands, 502 l. 01 s. 4 d. $\frac{3}{4}$, as by the said Work.

More Examples for Practice.

	(20)(12)			(20)(12)			(10)(20)(12)		
	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>
From	7	10	1	5	00	0	77	00	7
Take	4	07	9	3	11	5	57	04	6

Rem.	3	02	4	1	08	7	19	16	1
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Proof	7	10	1	5	00	0	77	00	7
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	(20)(12)(4)				(10)(20)(12)(4)				(20)(12)	
	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>q.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>q.</i>	<i>l.</i>	<i>s.</i>
Dr.	7	11	1	$\frac{1}{2}$	476	10	9	$\frac{1}{4}$	7	00
Cr.	4	17	3	$\frac{1}{4}$	277	17	7	$\frac{1}{4}$	4	10

Bal.	2	13	10	$\frac{1}{4}$	198	13	2		2	09	7
------	---	----	----	---------------	-----	----	---	--	---	----	---

Pr.	7	11	1	$\frac{1}{2}$	476	10	9	$\frac{1}{4}$	7	00	0
-----	---	----	---	---------------	-----	----	---	---------------	---	----	---

	(10)(20)(12)(4)				(10)(20)(12)			
	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>q.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>q.</i>
Borrowed	419	02	10	$\frac{1}{4}$	7174	11	1	
Paid	197	03	10	$\frac{1}{2}$	2176	15	9	$\frac{1}{4}$

Rem. due	221	18	11	$\frac{3}{4}$	4997	15	3	$\frac{3}{4}$
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Proof	419	02	10	$\frac{1}{4}$	7174	11	1	
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When

When a Sum is borrowed, or a Debt paid, at several Times, then you add the several Sums of Payment into one Total and subtraēt that Total from the first lent, or otherwise due.

Examples.

Suppose *A* lends *B* 70*l.* and *B* hath paid *A* at several Times, viz.

Lent,	—	<i>l.</i>	70	00	0
Paid at one Time,	—	24	10	0	
Another Time,	—	7	11	6	
Another,	—	20	00	0	
Another,	—	4	10	6	
Another,	—	1	01	6	
Paid in all,		57	13	6	
Remains due,		12	06	6	
Proof,		70	00	0	

To prove this, add the Sum paid in all, and the Sum resting due, together; and if they make the Sum first lent, the Work is right.

	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>
Lent	7	10	0	560	10	9 $\frac{1}{4}$	1	01	6
Paid at several Times	1	10	6	146	10	5	0	07	6
	0	11	9	17	15	0	0	01	6
	0	07	6	97	17	6	0	02	6
	2	10	6	76	00	0	0	01	6
	0	07	9	100	17	4	0	02	0
	1	10	0	100	01	7	0	01	0
Pd. in all,	6	18	0	539	01	10	0	16	0
Rem.	0	12	0	21	08	11 $\frac{1}{4}$	0	05	6
Proof,	7	10	0	560	10	9 $\frac{1}{4}$	1	01	6

A fami-

A familiar Example.

			<i>l.</i>	<i>s.</i>	<i>d.</i>
Received of Mr. East	—	—	59	06	0
<i>pd.</i> to Mr. West	—	—	20	00	0
<i>pd.</i> to Mr. North	—	—	14	13	6
<i>pd.</i> to Mr. South	—	—	15	12	0
Paid in all	—	—	56	05	6
Remains in the Bag			09	00	6

What Eight Sums of Pounds, Shillings, and Pence and all different, will amount to just 50*l.*

To do this you must observe the Directions given in Page 47. *Question 7*, for Sums of one Denomination; and see the following Work.

From *l.* 50 00 0 the Sum assigned.

The Seven Sums set down at random	{	4	17	6
		5	01	6
		1	01	6
		7	11	4
		6	04	2
		9	03	9
		8	13	5

Subtract 42 13 2

Remainder 7 06 10 The eighth Sum.

AVOIRDUPOIS-WEIGHT.

Here you are only to observe the Title of your Account, and borrow accordingly when there is Occasion.

Example 1.

Example 1.

An Ironmonger buys 74 Tuns, 13 C. 2 qrs. 14 lb. of Bilboa Iron, and hath sold out of the said Parcel, 56 Tuns, 11 C. 1 qr. 20 lb. How much remains unsold?

I set down the Sum as before directed, that each Denomination may stand under that of the same kind, and draw a Line under them, as may be seen in the Margin.

I begin at the Right Hand, and say, 20 from 14 I cannot, but 20 from 28 (so many lb. making a qr. of an Hundred, an Integer of the next Name) and there remains eight; which add to the 14, and they make 22, which I place under the Line;

	(10)	(20)	(4)	(28)
Tuns.	C.	qrs.	lb.	
74	13	2	14	
56	11	1	20	
18	02	0	22	

Proof

74	13	2	14

and go to the Quarters, and say, 1 that I borrowed, and 1 is 2, from 2, and there remains 0; which I also set down, then 11 from 13 C. and there rests 2, which I likewise put down, and go to the Tuns, saying, 6 from 4 I cannot, but 6 from 14, and there remains 8; then 1 that I borrowed, and 5 is 6, from 7, and there rests 1. And so the Work is done, and I find there remains unsold, 18 Tuns, 2 C. 0 qrs. 22 lb.

Example 2.

A Grocer buys 96 C. 2 qrs. 20 lb. of Raisins, and sells out again, 46 C. 3 qrs. 24 lb. what Quantity remains in his Hands?

	C.	qrs.	lb.	
Bought	96	2	20	Greater Number
Sold	46	3	24	Lesser Number

Remains in his Hands 49 2 24

Proof

96	2	20

Here

Here I say, 24 from 20 I cannot, but 24 from 28, and there remains 4; and the 20 over it makes 24, which I set down; then 1 that I borrow, and 3 is 4, from 2 I cannot, but 4 from 4, and there rests 0; but 2 that stands over it, is 2, which I set down; then 1 that I borrowed, and 6 is 7, from 6 I cannot, but 7 from 16, and there rests 9, and 1 that I borrowed, and 4 is 5, from 9, and there remains 4. So there remains in his Hands 49 C. 2 qrs. 24 lb, and proved by *Addition*, by putting the Remainder and *Lesser Sum* together, and they make the *Greater*; and therefore the Work is right.

Examples for Practice.

	(10)	(20)	(4)	(28)		(10)	(4)	(28)
	Tuns.	C.	qrs.	lb.		C.	qrs.	lb.
Received,	700	11	1	17		756	3	24
Deduct.	421	04	2	20		327	1	25
Rem.	279	06	2	25		429	1	27
Proof,	700	11	1	17		756	3	24

C.	qrs.	lb.	C.	qrs.	lb.	C.	qrs.	lb.
4	0	12	24	1	12	9	0	00
3	1	07	19	2	24	5	3	15
0	3	05	04	2	16	3	0	13
4	0	12	24	1	12	9	0	00

Admit I have on Board of a Ship from *Jamaica*, 94 Tuns, 13 C. 0 qrs. 00 lb. of *Log Wood*, and have received by several Lighters, as follows, viz.

On

		(10)	(20)	(4)	(28)
		Tuns.	C.	qrs.	lb.
On Board	—	94	13	0	00
By one Lighter	—	12	11	3	09
Another	—	19	14	0	21
Another	—	17	12	2	24
Another	—	15	14	3	06
Received,		65	13	2	04
Remains on board		28	19	1	24

	(10)	(4)	(28)		(10)	(4)	(28)
	C.	qrs.	lb.		C.	qrs.	lb.
Sugar bought,	49	3	12	Currants,	70	2	20
Sold at several Times.	4	1	14		10	1	14
	9	2	17		7	2	14
	4	1	25		1	1	20
	7	3	20		12	1	19
	8	1	27		9	3	12
	9	2	20		10	0	00
Sold in all,	44	2	11		51	2	23
Rem. unfold,	5	1	01		18	3	25
Proof	49	3	12		70	2	20

Avoirdupois small Weight.

	(10)	(16)	(16)		(10)	(16)	(16)
	lb.	oz.	dr.		lb.	oz.	dr.
Delivered,	4	10	14		46	13	10
Received,	2	09	09		27	15	14
Remains,	2	01	05		18	13	12
Proof.	4	10	14		46	13	10
					Delivered		

	(10)	(16)	(16)		(10)	(16)	(16)
	lb.	oz.	dr.		lb.	oz.	dr.
Delivered	55	00	00		79	15	14
Received	37	10	14		49	15	15
Refts due	17	05	02		29	15	15
Proof	55	00	00		79	15	14

TROY-WEIGHT.

	(10)	(12)	(20)	(24)		(10)	(20)	(24)
	lb.	oz.	dwt.	gr.		oz.	dwt.	gr.
Received	24	09	14	12		756	12	15
Melted	19	07	15	20		478	11	22
Remains	05	01	18	16		278	00	17
Proof	24	09	14	12		756	12	15
	(10)	(12)	(20)	(24)		(10)	(20)	(24)
	lb.	oz.	dwt.	gr.		oz.	dwt.	gr.
Received	370	07	12	20		7420	15	20
Delivered	174	11	09	22		5789	18	15
Remains	195	08	02	22		1630	17	05
Proof	370	07	12	20		7420	15	20

CLOTH-MEASURE.

	(10)	(4)	(4)		(10)	(5)	(4)
	Yds.	qrs.	N.		Ells	Eng.	qrs.
Bought	54	2	2		420	3	2
Sold	27	2	3		247	4	3
Remains	26	3	3		172	3	3
Proof	54	2	2		420	3	2

I might

I might give Examples in *Subtraction* of all the other Rules mentioned before in *Addition*, viz. of *Apothecaries Weight*, *Dry* and *Liquid Measure*, &c. but all of them being worked in the same Manner with those before, it is unnecessary.

C H A P. IV.

M U L T I P L I C A T I O N.

I N this Rule there are always two Numbers given to find out a Third, which will contain either of the given Numbers, as often as the other containeth Units.

II. This Rule also excellently and most concisely performeth the Work of *Addition*, either in simple or compound Numbers; as shall be illustrated and proved by fundry *Examples*, *Explications*, and *Improvements*, not hitherto treated of.

III. It likewise serveth to bring great Denominations into less, of the same Value; as *Pounds* into *Farthings*; and *Tuns Weight* into *Pounds Weight*, &c.

IV. *Multiplication* hath three Parts, or Things, particularly to be noted, and known, viz.

1st, The *Multiplicand*, or *Number* to be *Multiplied*; and is generally the greatest of the two Numbers given.

2^{dly}, The *Multiplier* or *Number* by which you *Multiply*; and is generally the least of the two Numbers given.

3^{dly}, The *Product*, or Result of the *Multiplication*; which is the Answer.

V. Before any Procedure can be made, the following *Table* must be got perfectly by Heart.

MULTI-

MULTIPLICATION-TABLE.

2 times, or rather twice	{	2	is	4	5 times	{	9	is	45		
		3		6			10	50			
		4		8			11	55			
		5		10			12	60			
		6		12							
		7		14			6 times	{	6	is	36
		8		16					7	42	
		9		18					8	48	
		10		20					9	54	
		11		22					10	60	
12		24	11	66							
			12	72							
3 times	{	3	is	9	7 times	{			7	is	49
		4		12			8	56			
		5		15			9	63			
		6		18			10	70			
		7		21			11	77			
		8		24			12	84			
		9		27							
		10		30			8 times	{	8	is	64
		11		33					9	72	
		12		36					10	80	
			11	88							
			12	96							
			9 times	{	9	is			81		
					10	90					
					11	99					
					12	108					
					10 times	{	10	is	100		
							11	110			
							12	120			
							11 times	{	11	is	121
			12	132							
			12 times	{					12	is	144
4 times	{	4	is	16	5 times	{	5	is	25		
		5		20			6	30			
		6		24			7	35			
		7		28			8	40			
5 times	{	8		32	6 times	{	8		64		
		9		36			9	81			
		10		40			10	100			
		11		44			11	121			
6 times	{	12		48	7 times	{	12		144		
7 times	{				8 times	{					
8 times	{				9 times	{					
9 times	{				10 times	{					
10 times	{				11 times	{					
11 times	{				12 times	{					
12 times	{				13 times	{					

The foregoing Table is so plain and easy, that it needs no Explanation; and therefore I shall proceed immediately to the Rule of Working.

VI. When any Number is given to be multiplied by another set the biggest uppermost, which is the *Multiplicand*, and under that your *Multiplier*, in the same Order as in *Addition* and *Subtraction*, viz. Units under Units, Tens under Tens, &c. Then draw a Line, and proceed, beginning at the Right Hand, and multiply every particular Figure of the *Multiplicand* by the *Multiplier*:

Example 1.

How much is 3 times 472 *Multiplicand*?
3 *Multiplier*.

Ans. 1416 *Product*

Here I say, 3 times 2 is 6, which I put under the line as in the *Example*; then 3 times 7 is 21, I set down 1, and carry 2, for the 2 Tens, to the next; (as in *Addition* of one Denomination) then 3 times 4 is 12, and 2 that I carry is 14; so because it is the last Figure I set down 14, and the Work is done, so I find that 3 times 472 is 1416, the *Product*, or Result of 472, multiply'd by 3.

If the said 472 be three times set down, one under the other, and added together, the Total will be the same with the *Product* above; which shews, that *Multiplication* briefly performs the Work of *Addition*, [as we said before] which is shewn in the Margin.

4	7	2
4	7	2
4	7	2
1	4	16

Example

Example 2.

How many makes 742 *Multiplicand*
 Multiply'd by 4 *Multiplier*

2968 *Product*

Here I say, 4 times 2 is 8, which I set down under the Line; then 4 times 4 is 16; I set down 6, and carry 1 for the 10 to the next Figure; then 4 times 7 is 28 and 1 that I carry is 29; and it being the last, I set down; so the Work is done, and I find the Product, Answer, to be 2968, as above.

To prove the Work, multiply the *Multiplier* by the *Multiplicand*, and if the Product prove [as before] the same Figures, it is right. This is the quickest and best Way of proving *Multiplication*, till *Division* be known.

I do not move the Sum to any other Place, but let stand as before multiply'd, and begin with the first Figure of the *Multiplicand*, towards the Right Hand, multiply the *Multiplier*, saying, twice 4 is 8, which I find to be right. Then to the next Figure, which is 4, and multiply the *Multiplier* by that, saying, 4 times 4 is 16, which is 6, and carry 1, which I also find right. Then to the next and last Figure in the *Multiplicand*, which is 7, and multiply the *Multiplier* 4 by that also, saying, 7 times 4 is 28, and 1 that I carried is 29, which I likewise find right; and so the Work is prov'd, and known to be truly wrought.

Example 3.

What is the Product of 90704 *Multiplicand*
 Multiplied by 8 *Multiplier*

725632 *Product*

Here I begin, saying, 8 times 4 is 32, I set down 2 and carry 3; then 8 times 0 is 0, but 3 that I carry is 3; then 8 times 7 is 56, I set down 6 and carry 5, then 8 times 0 is 0, but 5 that I carry is 5. Lastly, 8 times 9 is 72, which I set down, and the Work is done; as by the Example above. And this is proved as before, by multiplying the *Multiplier* by the *Multiplicand*, saying, 4 times 8 is 32, &c.

This Way of Proof is also a Perfecting any one in the *Multiplication Table*; because the Digits, or nine Figures are multiplied forwards and backwards; So that they may as readily answer, that 9 times 8 is 72, [not found in the Table, but reversely] as that 8 times 9 is the same.

More Examples for Practice.

Multiply 7460 Multiplicand
By 7 Multiplier

52220 Product or Answ.

How many are 9 times 365?
Or, how many Days in 9 Years?

3285

Multiplicand 432107
Multiplier 5

596432
6

Product 2160535

3578592

709543
7

675908
8

7654309
9

4966801

5407264

68888781

VII. When the Multiplier consists of more Figures than One, then there must be as many several Products as there are Figures in the Multiplier, and placed under the Line, and added together, and the Total is the whole Product required. But observe always to place the first Figure of each Product just under the Figure you multiply by, and so you move one Place towards the Left Hand for every Product, be as many as there will

Example 1.

How much is 24 times	365	Multiplicand
Or, how many Hours in a Year ?	24	Multiplier
	1460	Product by
	730	Product by
	8760	Total Product

The Numbers being placed in Order, as above, and according to the VIth Rule of this Chapter, after having drawn a Line under them, I begin with the first Figure of the Multiplier, *viz.* 4, saying, 4 times 5 is 20, I set down 0; and carry 2; then 4 times 6 is 24, and 2 I carry 26, that is 6 and carry 2; then 4 times 3 is 12, and 2 is 14; and so I have done with the Figure 4. Then I go to the second Figure in the Multiplier, *viz.* 2, and multiply the Multiplicand 365, by that also, saying, twice 5 is 10, I set down 0, and carry 1, which 0 I set down just under the Figure 2, that I multiply by, and go one Place farther to the Left Hand, as was said before. Then I go on, saying, twice 6 is 12, and 1 I carry, is 13, that is 3, and carry 1, and twice 3 is 6, and 1 is 7; and so I have done with this Figure of the Multiplier also; and then I draw a Line under these two Products, and add them together, and they make 8760 for answer. And so the Work is done, as may be seen in the Example above and may be proved as before.

Example

Example. 2.

Let it be required to multiply	527537
By	285
	2637685
	4220296
	1055074
	150348045

A Line being drawn under the two Numbers, I proceed, saying, 5 times 7 is 35, &c. going thro' all the Figures of the Multiplicand by 5, and find its Product to be 2637685, then I go to the next Figure in the Multiplier, viz. 8, and Multiply all the Figures of the Multiplicand by that also, and find the Product 4220296; then I multiply the Multiplicand by the last Figure, viz. 5, and the Product by that is 1055074. Then draw a Line under these three Products, I add them together, and find their Total to be 150348045, for the Product sought: That is, I find that 285 times 537 amounts to 150348045; as by the Work above may be seen.

VIII. Whenever the Multiplier is such a Number, as any two Numbers of the Multiplication Table be multiplied together, make the said Multiplier; as in foregoing Page, where the Multiplier is 24, and is made by multiplying 6 and 4 together. Then if you multiply the Multiplicand, by either of these Numbers, viz. either 6 or 4, and then multiply that Product by the other Number, the last Product shall be the Answer, and the same with the other Way.

D

Example

Examples.

365 Multiplied

4

1460

6

8760 Product. And so of any other.

There are sometimes Figures sav'd by this Method, and there is no Addition of Products.

More Examples.

4765

14

6796

17

476

19

19060

4765

47572

6796

4284

476

66710

115532

9044

56071592

123

275827

19725

168214776

112143184

56071592

6806805816

1379135

551654

1930789

2482443

275827

5440687575

How to prove Multiplication by the Cross.

The common way us'd in Schools is this: They make a Cross thus X, then add all the Figures in the Multiplier together, as in *Addition*, and cast away the Nines, as often as they arise, and bear the Remainder to the next Figure; and when they come to the End of the Line, they note what remains after the Nines are cast away, and set such Remainder on the left side of the Cross; and then they do the same by the Multiplicand, and note what remains there also, and set that on the Right of the Cross; then they multiply these two Figures together, and cast the Nines out of that Product, and set the Remainder on the Top of the Cross: Lastly, they cast away the Nines out of the Product, and if the Remainder be like the Figure on the Top of the Cross, they set it down at the bottom, and conclude the Work right.

But this way of Proof is not infallible, as I have experienced many times: But this may be said for it, that if the Sum be done right, it will never appear to be wrong by this Way; but it many times makes a Sum appear right, when it is utterly false; and therefore not to be depended on as a certain Proof. I'll give one Example to make the foregoing Directions the more intelligible; which shall be one of the preceding Sums set down in here, *viz.* the Second foregoing.

$$\begin{array}{r}
 \begin{array}{c} 3 \\ 8 \end{array} \begin{array}{c} \text{X} \\ 6 \end{array} \\
 \begin{array}{c} 3 \end{array}
 \end{array}
 \begin{array}{r}
 56071592 \text{ Multiplicand.} \\
 123 \text{ Multiplier} \\
 \hline
 6896805876 \text{ Product}
 \end{array}$$

Here, after having made the Cross, thus; X
begin at the Multiplicand, it's no matter at which End;
I'll begin towards the Left Hand, saying, 5 and 6 is
11, I cast away 9, and there rests 2, and 2 and
7 is 9, and there rests nothing; then 1 and 3
is 6, (I miss the 9) and 2 is 8, which I set
on the Left of the Cross, as it appears in the

D 2

Mar-

Margin. Then going to the Multiplier, I say, 1 and 2 is 3, and 3 is 6, which I place on the Right. Then multiply one by the other, saying, 8 times 6 is 48, I cast away 5 Nines out of it, and there remains 3, which I put on the Top, as you see in the Margin. After the same Manner I cast away the Nines out of the Product, and at the last there remains three likewise; and so the Work is done.

✠ *Note, That the Figures on each Side of the Cross being multiplied, make 48, and if you add them two Figures together, as they stand, and cast away the Nines, the Remainder will be the same; that is, instead of saying, how many Nines in 48? you say, 8 and 4 is 12; the Nines in 12, once, and there remains 3, as before.*

IX. The greatest Difficulty in Multiplication is, when there is a Cypher, or Cyphers intermixt with the Figures. In such Cases, only remember what was said before in the VIIth Rule, to move for every Figure, or Cypher, one Place towards the Left Hand, and to take Care that each first Figure of the several Products stand directly under its respective Multiplier; an *Example* will make it easy to be understood.

Let it be required to multiply 50710984, by 4050607 having set the Numbers down as before directed, with a Line under them, they stand thus:

$$\begin{array}{r}
 50710984 \text{ Multiplicand} \\
 4050607 \text{ Multiplier} \\
 \hline
 354976888 \\
 3042659040 \\
 2535549200 \\
 2028439360 \\
 \hline
 205410266767288
 \end{array}$$

Here I begin, saying, 7 times 4 is 28, &c. and so go through the Multiplicand by 7, and find its Product 54976888; then I come to a Cypher, which I set down under the second Figure of the above-mentioned Product, viz. 8, then I multiply the Multiplicand by the next Figure of the Multiplier, viz. (6 in the same Line) saying, 6 times 4 is 24; I set down 4 next to the Cypher, in the same Line, and it stands under the third Figure in the last Product, just under its Multiplier 6, and I find this Product, or Line, to be 3042659040. Then coming to another Cypher, I set it down just under its own Place, and go forward with the next Figure 5, in the same Line as before, saying, 5 times 4 is 20, &c. I set down the 0, just under 5 the Multiplier, and find this Product to be 2535549200. Then I come to another Cypher, and proceed as before, and find this last Line, or Product, 2028439360. All which Products being added together, make 205410266767288, for Answer. See the foregoing Work.

More Examples.

$$\begin{array}{r} 7864371 \\ 20604 \\ \hline \end{array}$$

$$\begin{array}{r} 31457484 \\ 471862260 \\ \hline 157287420 \end{array}$$

$$\begin{array}{r} 162037500084 \\ \hline \end{array}$$

$$\begin{array}{r} 327586 \\ 6030 \\ \hline \end{array}$$

$$\begin{array}{r} 9827580 \\ 19655160 \\ \hline \end{array}$$

$$\begin{array}{r} 1975343580 \\ \hline \end{array}$$

X. When there is a Cypher, or Cyphers, in the Multiplier towards the Right Hand, then set it, or them backward from the Place of Units, towards the Right Hand, and multiply by the significant Figure or Figures, as usual; and afterwards annex the Cypher, or Cyphers, to the general Product, on the Right Hand, in the following

D 3

Examples.

Examples.

326 20	4762 70	4796 400
6520	333340	1918400
746094 3600	729764 476000	
4476564.00 2238282	4378584.000 5108348	
2685938400	2919056	
	347367664000	

XI. When there are Cyphers both in the Multiplicand and Multiplier, then omit the Cyphers in both, and you have multiplied by the significant Figures; and then join the Cyphers in each to the Product; as in these

Examples.

42600 220	423000 5600	376400 2400
8520 852	2538000 2115	1505600 7528
9372000	2368800000	903360000

CONTRACTIONS.

Or, how to multiply by 10, 100, 1000, 10000, &c.

To multiply by	$\left\{ \begin{array}{l} 10 \\ 100 \\ 1000 \\ 10000 \\ 100000 \end{array} \right\}$	Add to the Multiplier and	$\left\{ \begin{array}{l} 0 \\ 00 \\ 000 \\ 0000 \\ 00000 \end{array} \right\}$
----------------	--	---------------------------	---

Example

Example.

$$\begin{array}{r}
 428 \\
 \text{Multiply'd} \\
 \text{by}
 \end{array}
 \left\{
 \begin{array}{l}
 10 \\
 100 \\
 1000 \\
 10000 \\
 100000
 \end{array}
 \right\}
 \text{ makes }
 \left\{
 \begin{array}{l}
 4280 \\
 42800 \\
 428000 \\
 4280000 \\
 42800000
 \end{array}
 \right.$$

If you would be Expeditionous and Dextrous in *Ac-
compts* always to multiply by 11 and 12, that the Pro-
duct may be in one Line only.

Examples.

Mult. 456	7890	3425
By 11	11	11
Prod. 5016	86790	37675

In the first of these, I say, 11 times 6 is 66, 6 and go 6; and 11 times 5 is 55, and 6 is 61, 1 and go 6; and 11 times 4 is 44, and 6 is 50, as above; and so of the rest.

Mult. 1234	56789	30762
By 12	12	12
Prod. 14808	681468	369144

Here I say, 12 times 4 is 48, 8 and carry 4; and 12 times 3 is 36, and 4 is 40, 0 and go 4, &c.

When any Number is to be multiplied by 5, it may be contracted by annexing a Cypher to the Number, and then halve it, because 5 is the $\frac{1}{2}$ of 10.

And the Rule holds good for Brevity if a Number is to be multiplied by 15. Example, Multiply 567 by 15,

$$\begin{array}{r}
 5670 \\
 \hline
 \frac{1}{2} \quad 2835 \\
 \text{By } \quad 3 \text{ because 3 times 5 is 15.} \\
 \hline
 8505
 \end{array}$$

D 4

When

When you multiply by any of these compound Numbers, *viz.* 110, 120, 1100, or 1200, then multiply as before, and annex the Cyphers afterwards.

Examples.

Mul.	3762	34567	46972	96791
By	110	120	1100	1200
Prod.	413820	4148040	51669200	116155200

Which way of Multiplying is much better than the following.

Or thus,

$$\begin{array}{r}
 3762 \\
 110 \\
 \hline
 37620 \\
 3762 \\
 \hline
 413820
 \end{array}$$

$$\begin{array}{r}
 34567 \\
 120 \\
 \hline
 691340 \\
 34567 \\
 \hline
 4148040
 \end{array}$$

XII. To multiply by Article Numbers, *viz.* 13, 14, 15, &c. a 20, to have the Work in one Line.

Examples.

$$\begin{array}{r}
 74974 \\
 13 \\
 \hline
 974662
 \end{array}$$

$$\begin{array}{r}
 45678 \\
 18 \\
 \hline
 822204
 \end{array}$$

Or thus,

$$\begin{array}{r}
 74974 \\
 224922 \\
 \hline
 974662
 \end{array}$$

$$\begin{array}{r}
 45678 \\
 365424 \\
 \hline
 822204
 \end{array}$$

RULE

RULE for the two first Examples.

Multiply each Figure in the Multiplicand by the Unit Figure of the Multiplier, adding to each single Product its back Figure; and to the last Figure add what you carry.

As in the first Example, I say, 3 times 4 is 12, 2 and go 1; and 3 times 7 is 21, and 1 carried is 22, and 4, the back Figure of the Multiplicand, is 26, 6 and go 2; and 3 times 9 is 27, and 2 is 29, and 7, the back Figure, is 36, 6 and go 3; and 3 times 4 is 12, and 3 is 15, and 9, the back Figure, makes 24, 4 and carry 2; then 3 times 7 is 21, and 2 is 23, and 4 the back Figure is 27; 7 and go 2, which 2 add to the last Figure 7, and it makes 9, as in the Work.

In the two last Examples, I multiply by the Unit Figure of the Multiplier, and set the first Figure of the Product one Place forward to the Right Hand, &c.

XIII. To multiply by a *mixt Number*; that is a *whole Number* joined with a *Fraction*, whether it be $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, or $\frac{1}{5}$.

The RULE.

When you have multiplied by the whole Number, take the $\frac{1}{4}$, the $\frac{1}{2}$, the $\frac{3}{4}$ the $\frac{1}{3}$ or the $\frac{1}{5}$, of the Multiplicand, and add it to the Product, and that Total shall be the whole Product, as in the following *Example*.

Example 1.

In 276 Barrels of Raisins
Each $3\frac{1}{4}$ C. How many Hundred Weight?

828 The Product by 3.

69 The 4th Part of the Multiplicand, 276.

Ans. 897 Hundred Weight in all.

D 5

Example 2.

Example 2.

In 756 Pieces of Stuffs,
Each 24 $\frac{1}{2}$ Yards, how many Yards?

3024

1512

378 the Half of the Multiplicand, 756,

Answ. 18522 Yards in all.

Example 3.

In 63 Fodder of Lead,
Each 19 $\frac{1}{2}$ C. How many Hundreds?

567

63

31 $\frac{1}{2}$ the Half of 63, the Multiplicand.

Answ. 1228 $\frac{1}{2}$ Hundreds Weight in all.

If the Multiplier had been accounted Money, or 19s 6d. and the Multiplicand 63 Integers, at that Price, then the Product would have been 1228s. 6d. or 61 l. 8s. 6d.

Example 4.

In 24 Casks of Tobacco,
Each 2 $\frac{3}{4}$ C. How many Hundreds?

48

12 The Half of 24.

6 The 4th Part of 24, or Half of 12.

Answ. 66 Hundreds in all.

'T would have been the same if I had said 24 pr. of Stockings, or any thing else, at 2s. $\frac{3}{4}$, or 2s. 9d. (for 9d. is $\frac{3}{4}$ of a Shilling) then the Product would have been, 66s. or 3 l. 6s.

Example 5

Example 5.

At 224 French Crowns
 $54\frac{1}{3}d.$ pr. Crown

896
 1120

$74\frac{2}{3}$ The $\frac{1}{3}$ of 224 , the Multiplicand.

Pence $12170\frac{2}{3}$

Example 6.

At 340 Gros of Paste-Boards
 $7\frac{1}{3}d.$ per Gros, Custom

2380
 68 The $\frac{1}{5}$ Part of 340

Prod. 2448 Pence

This Method of multiplying by a mixt Number, is of excellent use in a Multitude of Cases, particularly in Exchange of Money of different Nations.

XIV. I shall now shew the excellent use of *Multiplication*, in answering all manner of Questions, that ordinarily occur in Business; where we have the Price of one Thing, and want to know the value of many Things at that Rate; and shew that it performs the Office, and answers the Work of Questions in the *Rule of Three Direct*, of that kind; but in a much conciser Method, and more elegant Manner; and that by such easy Rules and Directions, that any one who understands *Addition of Money*, shall as readily cast up any thing this Way, as he shall in a Sum in that: For nothing is more required here, than to carry from one Denomination to the next, exactly as we do there; and therefore it may be truly said, that this *Rule* performeth the Work of many *Additions*, as was hinted before.

Example

Example 1.

	s.	d.	
How much is 3 times	11	9	Multiplicand?
Or 3 Yards of Cloth, at		3	Multiplier.
11s. 9d.			
	1	15	3 Prod. or Answ.

The RULE.

Observe always to multiply the Price by the Quantity, and the Product is the Answer.

Here I say, 3 times 9 is 27 Pence, which is 2s. and 3d. I set down 3d. under the Place of Pence, and carry the 2s. to the Shillings; then 3 times 11 is 33, and that I carry is 35s. which is 1l. 15s. I set down the 15s. under the Shillings Place, and set down the 1 Pound a little forward to the Left Hand; and so the Question is answered, and found to amount to 1l. 15s. 3d. as by the Work above. Now here is no more difficulty than in *Addition*; it being the same in effect, and altogether as easy.

l.	s.	d.
	11	9
	11	9
	11	9
1	15	3

If 11s. 9d. is three times set down, as in *Addition*, and cast up, it will prove the same, as may be seen in the Margin; and is a sure Proof of the Truth of this Method.

Example 2.

How much is 5 times 7s. 4d.? Or, 5 Gallons of Brandy, at 7s. 4d.

	s.	d.	
Multiplicand,	7	4	The Price
Multiplier,		5	The Quantity
Product,	1	16	8 Answ.

Here

Here I say, 5 times 4 is 20 Pence, which is 1 s. 8 d. I set down 8 and carry 1, just as in *Addition of Money*, (and nothing more is required to be remembered, let the *Example* be what it will) and 5 times 7 is 35 s. and 1 I carried is 36 s. which is 1 l. 16 s. I set down the 16 s. under the Place of Shillings, and the 1 l. towards the Left Hand, and the *Answer* is 1 l. 16 s. 8 d. as above.

Example 3.

What is 7 times 21 d.? Or, seven Stone of Beef,

	s.	d.	
At	—	—	—
	1	9	Price
		7	Quantity
	12	3	

Here I say, 7 times 9 is 63 d. that is 5 s. 3 d. set down 3, and carry 5, and 7 time 1 is 7, and 5 is 12; which makes 12 s. 3 d. for the Answer.

Example 4.

What comes 9 lb. of Tea to, at 9 s. 9 d. $\frac{1}{2}$ per Pound?

l.	s.	d.	q.
	9	9	$\frac{1}{2}$
			9
4	8	1	$\frac{1}{2}$

I say here, 9 times 2 is 18, 18 Farthings is 4 d. $\frac{1}{2}$, I set down $\frac{1}{2}$, and carry 4; then 9 times 9 is 81, and 4 I carry is 85 Pence, which is 7 s. 1 d. I set down 1, and carry 7; then 9 times 9 is 81, and 7 is 88 Shillings, which makes 4 l. 8 s. I set down 8 s. and the 4 l. out to the Left Hand, as before; and the *Answer* is 4 l. 8 s. 1 d. $\frac{1}{2}$, as above.

Example 5.

Example 5.

What comes 10 times
Or 10 lb. of Nutmegs, at 11 s. 6 d.

l.	s.	d.
	11	6 to?
		10
5	15	0

Here 10 times 6 is 60 Pence, which is just 5 s. I set down 0, and carry 5, then 10 times 11 is 110, and is 115 Shillings, which is 5 l. 15 s. for the Answer.

Example 6.

How much is 11 times
Or 11 Pistoles at ditto?

s.	d.
17	0
L 9	12

I say here, 11 times 6 is 66 Pence, which is 5 s. 6 d. I set down 6 and carry 5; then 11 times 7 is 77, and that I carry is 82, I set down 2 and carry 8; then 11 times 1 is 11, and 8 is 19; and in regard they are many *Angels* (it being in the Tens of Shillings) I take the Half of them, which is 9, or 9 Pounds, and Ten Shillings over, which I put to the Left of the 2 s. set down before, and they make 12 s. and the 9 l. I set at a proper Distance towards the Left Hand, as in the Example may be seen.

Example 7.

What comes 12 Sheep to, at

s.	d.
13	4
	12
L 8	00 00

Answer

Note

Chap. 4. Multiplication.

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Note, 'Tis best to multiply the Shillings as simple Numbers, for every 10 carrying 1, &c. and then to halve the Tens of Shillings, which half is always so many Pounds; and if they halve even, set down a Cypher in the Tens of Shillings Place; but if odd, then set down a 1 in that Place. Instances of both may be observ'd in the two last Sums.

In the last Sum I said, 12 times 4 is 48 Pence, or 4 s. set down 0, and carry 4; then 12 times 3 is 36, and 4 is 40, I set down 0, and carry 4 for 4 Tens; then 12 times 1 is 12, and 4 is 16, the Half of 16 is 8, which is 8 Pounds for Answer, as in the Work.

Some more Examples.

9 lb. of Cinnamon, at

l.	s.	d.
	7	2
		9

Ans^w. 3 04 6

8 C. of Sugar, at

	44	4
		8

Here the $\frac{1}{2}$ of 35 is 17 and a $\frac{1}{2}$

17	14	8
----	----	---

12 Pair of Stockings, at per Pair

9	8
	12

Ans^w. 5 16 0

7 C. of Hops, at

3	06	6
		7

Ans^w. 23 05 6

11 Ounces.

11 Ounces of *Silver*, at

<i>l.</i>	<i>s.</i>	<i>d.</i>
0	5	5

<i>Answ.</i>	3	0	0
--------------	---	---	---

10 Pipes of *Wine*, at

<i>per Pipe</i> , 24	15	0
		10

<i>Answ.</i>	247	10	0
--------------	-----	----	---

6 Yards of *Flannel*, at

1	2
	6

<i>Answ.</i>	7	0
--------------	---	---

9 C. of *Tallow*, at

34	6
	9

Here the $\frac{1}{2}$ of 31 is 15 and a $\frac{1}{2}$

15	10	6
----	----	---

XV. When the Quantity exceeds 12, find two Numbers in the *Multiplication Table*, which being multiplied together will make the Quantity: Then multiply the *Price* by one of the Numbers, (it matters not which you multiply first by) and then that Product by the other Number, and the last Product will be the Answer.

Example 1.

What is 18 times
Gallons of Brandy at
4 s. 6 d. per Gallon.

<i>l.</i>	<i>s.</i>	<i>d.</i>
	4	6

Or 18
3 the 1st Multiplier.

13	6
----	---

the 1st Prod. by 3
6 the 2d Multiplier.

<i>Anf.</i>	4	1	0
-------------	---	---	---

the last Prod. by 6
Here

Here I find this Quantity hit two ways (as many times happens) *viz.* either by 3 and by 6, or by 2 and by 9; either of them multiplied together make the Quantity, *viz.* 18.

l.	s.	d.
	4	6
		2
	9	0
		9
	4	1 0

Here is the Answer produced by 2 and 9 as above.

Example 2.

How much is 32 times
Or, 32 lb. of Tea, at
5 s. 9 d. $\frac{1}{2}$ per Pound?
The first Product by 4,
The second Multiplier,

l.	s.	d. q.
	15	9 $\frac{1}{2}$
		4
	3	03 2
		8
<i>Ans^w.</i>	25	05 4

Here the Numbers are 4 and 8; 4 times 8 making 32, the Quantity; wherefore I begin, and say, 4 times 2 is 8 Farthings, which being just Two-pence, I carry it to the Pence; then 4 times 9 is 36, and 2 is 38 Pence, which is 3 s. and 2 d. I set down 2, and carry 3 s. &c. After I have multiplied by 4, I find that Product to be 12 l. 3 s. 2 d. which I multiply by 8, the other Number, and find the last Product, or Answer, to be 25 l. 5 s. 4 d. as in the Work may be seen.

What

What is 120 times
Or 120 Quarters of
Corn, at 19 s. 8 d.
per Quarter?

l. s.
19

9 16

Answ. 118 00

Here 10 times 12 make 120 the Quantity; wherefore I multiply first by 10, and that Product is 9 l. 16 s. 8 d. which I multiply by the other Number 12, and that produces 118 l. for the Answer.

77 C. of Madder, at

l. s.
3 15

26 08

Answ. 290 13

Here 11 times 7 makes the Quantity; when I come to multiply by the second Multiplier, viz. 11, I say, 11 times 6 is 66, which is 5 s. 6 d. I set down 6, and carry 5; then 11 times 8 is 88, and 5 is 93 s. which is 4 l. 13 s. I set down 13 and carry 4; then 11 times 6 is 66, and 4 is 70, I set down 0, and carry 7 for the seven Tens; then 11 times 2 is 22, and 7 is 29, &c.

More Examples.

15 Yards of Ribbon, at

l. s.
2

6

Here 3 times 5 is 15, the Quantity.

Answ. 1 11

21 Yards

Chap. 4.

Multiplication.

81

21 Yards of *Tabby*, at

<i>l.</i>	<i>s.</i>	<i>d.</i>
5	11	7

Here 7 times 3 is 21
the Quantity.

2	01	5
		3

• Answ. 6 04 3

72 Gallons of *Wine*, at

5	4
	6

Here 6 times 12 makes 72,
the Quantity, or 8 times
9 makes 72 likewise

1	12	0
		12

Answ. 19 04 0

81 lb. of *Nutmegs*, at

<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>q.</i>
12	3	$\frac{3}{4}$	9

Here 9 times 9 makes the Quantity

5	10	9	$\frac{3}{4}$
			9

Answ. 49 17 3 $\frac{3}{4}$

XVI. When the Quantity is such a Number, that no two Numbers in the Table can be found to answer it, then multiply by two such Numbers as come nearest to the Number given, as before; and for the Number wanting, to make up the Number given, multiply the Price of one by the Number that is wanting, and add it to the other Product, and the Total will be the Answer.

Example 1

Example 1.

39 C. of Currants, at

	<i>l.</i>	<i>s.</i>
per C.	2	13

16	01
----	----

The Price 2*l.* 13*s.* 6*d.* }
 multiply by 3 }

96	06
8	00

Answ. 104 06 6

Here I find the two Numbers that come the nearest are 6 times 6, by which I multiply as before, and the last Product is 96*l.* 6*s.* 0*d.* but 6 times 6 is but 36, and the Quantity is 39, so that there is 3 C. wanting; wherefore, I multiply the Price 2*l.* 13*s.* 6*d.* by 3, and it produces 8*l.* 00*s.* 6*d.* to be added to the last Product 96*l.* 6*s.* 0*d.* which together make 104*l.* 6*s.* 6*d.* for the Answer.

79 Firkins of Butter, at

	<i>l.</i>	<i>s.</i>
	00	17

6	02
---	----

Here the two Numbers that come nearest, are 7 times 11, which is 77,
 The Price multiplied by (2) }
 that are wanting,

67	07
01	15

Answ. 69 02 6

More

More Examples.

87 Grofs of Pipes, at per Grofs

l. s. d.
1 4 7

09 4 8

03 14 8
00 01 4

Ans^w. 03 16 0

6 C. $\frac{3}{4}$ of Ship Bisket, at

13 6 6

4 01 0
12

48 12 0

02 14 0

00 06 9

00 03 4 $\frac{1}{2}$

Ans^w. 51 16 1 $\frac{1}{2}$

87 Ells of Holland, at

Here 7 times 12 is 84, and 3 is 87

3 5 $\frac{1}{2}$
7

1 04 2 $\frac{1}{2}$
12

14 10 6
10 4 $\frac{1}{2}$

Ans^w. 15 00 10 $\frac{1}{2}$
11

The Price multiplied by 3

If I had multiplied by 11 times 8, which is 88, and subtracted the Price of 1 from the Product, the Remainder would have been the Answer, as before.

97 C. $\frac{1}{2}$ of Cheese, at

per C. l. s. d.
25 6 8

10 4 0
12

For the 1 C. wanting

The Half of the Price for the Half C.

122 08 0
1 05 6
12 9

Answ. 124 06 3

Thus by the various *Examples* foregoing, is manifestly seen, That when the Price of one Thing is given, the Price of many, (at the same Rate) may be found by *Multiplication* only; and sooner, and much handsomer than by the *Rule of Three*.

Large Sums may be cast up this Way, as well as small, observing the Directions following.

When your Sum is 1, 2, 3, 4, or more hundreds, always multiply the Price by 10, and then that Product by 10 also, which produces the Value of one Hundred; then multiply that Product by the Number of Hundreds, whether 2, 3, 4, or 5, &c. and that Product is the Value of so many Hundreds as there are; then for the Tens, whether 20, 30, 40, &c. multiply that Product which gives the Price of 10, either by 2, 3, 4, or 5, as the Tens shall happen, which Place under the last Product, without drawing a Line; and for the Units always multiply the Price by them, whether 2, 3, 4, &c. and set that also just under the former Products, so that you will have three Lines to add together, and the Total of them is always the Answer. An *Example*, or two, will make it easy to be understood.

Example 1.

Example 1.

	<i>l.</i>	<i>s.</i>	<i>d.</i>
What is 648 times		4	6
648 lb. of Indigo, at ditto?			10
The Value of [10]	2	05	0
			10
The Value of [100]	22	10	0
The Number of Hundreds			6
The Value of [600]	135	00	0 600
The Price of [10] mult. by [4]	9	00	0 40
The Price multiplied by [8]	1	16	0 8
Anfw.	145	16	0 648

First I multiply 4 *s.* 6 *d.* the Price, by 10, and that produces 2 *l.* 5 *s.* for the Price of 10; also I multiply said 2 *l.* 5 *s.* for the Price of 10, by 10 again, and that produces 22 *l.* 10 *s.* for the Value of 100; then I multiply the Value of 100, by 6, the Number of Hundreds, and that Product is the Value of 600, being 135 *l.* 00 *s.* *d.* wherefore I am only now to find out the Value of 48. For the four Tens in 48, I multiply the Price of *viz.* 1 *l.* 2 *s.* 05 *d.* by 4, and that Product shews the Value of 40, which is 9 *l.* Then for the 8 Units in the I multiply the first Price, *viz.* 4 *s.* 6 *d.* by 8, and that Product gives the Value of 8, which is 1 *l.* 16 *s.* All which being added together, (that is, only the three Lines that have no Line of Separation between them) produces 145 *l.* 16 *s.* 0 *d.* for Answer.

And thus may any Sum be done, let it be as large as will; only when the Sum consists of Thousands, you need 4 Lines to add together, but when but of Hundreds, then but three.

Example 2.

Example 2.

	<i>l.</i>	<i>s.</i>	<i>d.</i>
355 Ells of <i>Holland</i> , at		2	3 $\frac{1}{2}$ 10
The Value of [10]	1	02	11 10
The Value of [100]	11	09	2 3
The Value of [300]	34	07	6 30
The Value of 10 mult. by [5]	5	14	7 5
The Price by 5 Units	0	11	5 $\frac{1}{2}$
<i>Answ.</i>	40	13	6 $\frac{1}{2}$ 35

Example 3.

	<i>l.</i>	<i>s.</i>	<i>d.</i>
966 lb. of <i>Bohea Tea</i> at		14	5 10
The Value of [10]	7	04	2 10
<i>Ditto</i> of [100]	72	01	8
The Number of Hundreds			9
The Value of [900]	648	15	0 90
The Value of 10 mult. by [6]	43	05	0 6
The Price of 1 mult. by [6]	4	06	6
<i>Answ.</i>	696	06	6 96

Example

Example 4.

	<i>l.</i>	<i>s.</i>	<i>d.</i>	
8954 Gallons of Rum, at		03	5	
			10	
The Price of (10)	1	14	2	
			10	
The Price of (100)	17	01	8	
			10	
The Price of (1000)	170	16	8	
The Number of Thousands			8	
The Value of 8000	1366	13	4	8000
The Value of (100) mult. by 9,	153	15	0	900
The Value of (10) mult. by 5,	8	10	10	50
The Price mult. by 4 Units	0	13	8	4
<i>Ans^r.</i>	1529	12	10	8954

have insisted the longer on this excellent Method, it might be well understood; not only for its elegant, expeditious, and facile Dispatch of ordinary Affairs; but for its Utility in contracting many Operations under Rules, as the *Rule of Three*, &c.

Now it is not customary to introduce any thing of this kind to be learnt so early; imagining (it may be) the mind not capable of understanding them, 'till he has made farther advances in *Arithmetick*; but since they are so useful in *Multiplication*, the foregoing Methods properly belong to the *Rule*, and may well be taught in it, especially as they are of such excellent use in all manner of Business; and may be of Service to some, whose Leisure or Inclination admit of no larger Improvements in *Arithmetick*.

Quantities of Weight, Measure, &c. are expeditiously found by this Method of multiplying by Compound Parts.

Examples.

In 64 Barrels of *Anchovies*, each how many Pounds? Multiply by $30 \frac{1}{2}$ lb.
8 and

Answ. 1952

In 56 Firkins of *Butter*, each how many Pounds? Multiply by 56 lb.
7 and

Answ. 3136

In 98 Casks of *Capers*, each how many Hundreds, &c. C. qrs. lb.
3 3 14
10, 9 and

Answ. 379 3 0

In 104 Bars of *Spanish Silver*, each how many oz? $46 \frac{1}{4}$ Oz.
10, 10 and

Answ. 4810 Oz

In 48 Packs of *Linen*, each how many Ells *Flemish*? Mult. by 4225 Ells
6 and

202800

I might here also shew the Method of *Cross Multiplication*; or multiplying *Shillings* and *Pence* by *Shillings* and *Pence*; or *Feet* and *Inches*, by *Feet* and *Inches* (being all one) and some other Methods in *Practical Multiplication*; but there being too much of *Division* with them, I shall defer them till I come to another Place.



C H A P. V.

D I V I S I O N,

IS a *Rule*, by which we discover how often one Number is contained in another; as if it were asked, How often is 8 contained in 48; The Answer would be 6 times. It likewise serveth to bring small Denominations into greater; as *Farthings* into *Pounds*, and *Pounds Weight* into *Tuns Weight*, &c.

II. This *Rule* is comprehended under Three certain Branches, and one uncertain, *viz.*

1. The *Dividend*, or Number given to be divided.
2. The *Divisor*, or Number given to divide by.
3. The *Quotient*, or Number of equal Parts, shewing how often the *Divisor* is contained in the *Dividend*.
4. The *Remainder*, after the Work is ended; which is always of the same Name or Quality with the *Dividend*; and must be less than the *Divisor*, if the Work be right: And this is the uncertain Branch, because there is sometimes a *Remainder*, and sometimes not.

III. *Division* is either Single or Compound. Single, when the *Divisor* consisteth of one Figure only, and the *Dividend* of two at the least. Any thing of this Kind answered by the *Multiplication Table*; as if 54 were to be divided by 6, the Answer would be 9; for 6 is contained 9 times in 54: Here 54 is the *Dividend*; 6 the *Divisor*; and 9 is the *Quotient*, or Answer.

IV. *Compound Division* is when the *Dividend* consisteth of many Places or Figures, and the *Divisor* of one or more Figures. As if 365, the Days in a Year, were to be divided by 7, the Days in a Week; 365 is the *Dividend*, 7 is the *Divisor*, 52 the *Quotient*, and 1 the *Remainder*.

$$\begin{array}{r}
 \text{Dividend.} \\
 \text{Divisor } 7 \overline{)365} \text{ } 52 \text{ Quot.} \\
 \underline{35} \\
 15 \\
 \underline{14} \\
 (1) \text{ Remainder.}
 \end{array}$$

A General Rule for the Working.

N. B. $\left\{ \begin{array}{l} 1 \text{ Seek,} \\ 2 \text{ Multiply,} \\ 3 \text{ Subtract.} \end{array} \right.$

This *Rule* comprehends Three of those foregoing, and is accounted the hardest Lesson of *Arithmetick*; but I shall, by plain *Rules* and familiar *Examples*, render it easy to the meanest Capacity. And as in *Multiplication*, so in this *Rule*, I shall endeavour at some new Improvements; discovering that many Things in this *Rule*, may be abridged, and shew its excellent Use in answering many Questions, which seem to require a more progressive Knowledge in *Arithmetick*.

Example 1.

Let it be required to divide 7420 by 5; in order to which, I place my *Dividend*, or Sum to be divided, into 4 equal Parts, or Shares thus, 7 4 2 0. Then I place my *Divisor* 5, before the *Dividend*, with a crooked Line before it, and a strait Line drawn underneath it thus

$$\begin{array}{r}
 5 \overline{)7420} \\
 \hline
 \end{array}$$

The

Then I proceed according to the *Rule*; and first I seek, saying, how many times 5, the *Divisor*, can I have in 7, the first Figure of the *Dividend*, and the Answer is once, which I place under the Line just under the 7; then according to the *Rule*, I multiply, saying, once 5, (the *Divisor*) is 5; then as the *Rule* directs, I subtract, saying, 5 from 7, and there remains 2, which are 2 Tens, which I suppose to stand before the next Figure in the *Dividend*, viz. 4, and so makes it 24,

$$\begin{array}{r} 5 \overline{)7420} \end{array}$$

I
for a new *Dividend*. Then again I seek, saying, how many times 5, the *Divisor*, can I have in 24 the *Dividend*? And the Answer is 4 times, which I place under the Line just under 4 the second Figure in the *Dividend*, then I multiply, saying, 4 times 5, the *Divisor*, is 20, which I subtract from 24, and there rests 4, which being 4 Tens, makes the next Figure 2, in the *Dividend*, to be 2. Then again I seek how many times 5 I can have in 2, and the Answer is 8 times, which I put under the Line just under 2, the 3 Figure in the *Dividend*; then I multiply, saying, 8 times 5 is 40, which I subtract from 42, and there remains 2, which 2 Tens make the Cypher in the *Dividend* to be 20; then I say, how many times 5, the *Divisor*, in 20, and the Answer is 4 times; then 4 times 5, the *Divisor*, is 20, from 20, and there remains nothing, and so the Work is done; as by the following *Example*.

Divisor 5)7420(*Dividend*.

$$\begin{array}{r} 1484 \text{ Quotient, or Answer.} \end{array}$$

So that I find by the Work, that 5 is contained in 7420 just 1484 times; Or if the *Dividend* had been so many *Shillings* or *Pounds*, to be parted among 5 Persons, each Person must have had so many *Shillings*, or *Pounds*, for his Share.

V. When the first Figure of your *Dividend* is lesser than the *Divisor* or first Figure of your *Divisor*, then make the two first Figures of the *Dividend*, your *Dividend*, and work as before.

Example.

Divide 4263 Gallons of *Wine* among 7 Persons; Having set down the *Dividend*, for the Work as before, with the *Divisor* before it, thus,

$$\begin{array}{r} 7 \overline{)4263} \text{ (Dividend)} \\ \underline{609} \text{ Quot.} \end{array}$$

I proceed, aying, How many times 7, the *Divisor* can I have in 4, the first Figure of the *Dividend*; and knowing I cannot take 7 out of 4, I take it out of 42, the two first Figures of the *Dividend*, and the Answer is 6 times, which I put just under 2, the second Figure of the *Dividend*, and then multiply, saying, 6 times 7, the *Divisor*, is 42, from 42, and there remains nothing. Then the Sevens that are in 6 (for you must never take more than one Figure, or Cypher, at a time out of the *Dividend*, except you are obliged to do it at first) I cannot take, wherefore I put a Cypher in the *Quotient*, under 6, and the 6 remains as so many Tens, and makes the next or last Figure in the *Dividend* 3, to be 63; then the Sevens in 63, 9 times, and the Work is done; and the *Quotient* is 609, or 609 Gallons for each Man's Share.

The Proof.

To prove this or any other Sum in *Division*, multiply the *Quotient* by the *Divisor*, and if the *Product* is like the *Dividend*, the Work is right: But observe, whenever there is a *Remainder*, such *Remainder* must be taken in, or added to the *Product*.

Example.

Example.

$$\begin{array}{r}
 7 \overline{)4263} \\
 \underline{609} \\
 7 \\
 \underline{00} \\
 4263 \text{ Proof}
 \end{array}$$

Here I say, 7 times 9 is 63, 3 and carry 6, then 7 times 0 is nothing, but 6 is 6; lastly, 7 times 6 is 42; so that I find this *Product* to be the very same Figures with the *Dividend*; therefore the Work is right.

So likewise as *Multiplication* proves *Division*, doth *Division* prove *Multiplication*. For if you divide the *Product* by the *Multiplier*, the *Quotient* (if the Work is right) will be the same with the *Multiplicand*. As thus:

In proving the last Sum, 609 is the *Multiplicand*, and 4263 is the *Product*, and 7 the *Multiplier*. Now if the *Product* 4263 be divided by 7 the *Multiplier*, the *Quotient* will be 609 the *Multiplicand*, as may be seen in the foregoing Work.

Example.

Divide 97961 Pieces $\frac{1}{9}$ among 9 Men.

$$\begin{array}{r}
 9 \overline{)97961} \\
 \underline{10884 \frac{5}{9} \text{ Answer}} \\
 9 \\
 \underline{00000} \\
 97961 \text{ Proof}
 \end{array}$$

E 4

Here

Here I say, the Nines in 9, once; which I put under the Line, just under 9 in the *Dividend*, and then I multiply, saying, once 9 from 9, and there remains nothing; then the Nines in 7 none; wherefore I set down a 0, in the *Quotient*, just under 7, and the 7 remains, and makes the next Figure 9 in the *Dividend*, to be 79; then the Nines in 79, are 8, then 8 times 9 is 72, from 79, and there rests 7, which makes the next Figure 6, in the *Dividend*, to be 76; then the Nines in 76 are 8; 8 times 9 is 72, from 76, and there rests 4, which makes the next and last Figure in the *Dividend* to be 41; then the Nines in 41 are 4; 4 times 9 is 36, from 41, and there rests 5, which is the *Remainder*; and may be set at some small Distance from the *Quotient*, towards the Right Hand, with the *Divisor* 9 under it, thus, $\frac{5}{9}$. So that there are 5 parts of 9 over, besides 10884, that comes to each Man's Share, and is called a *Fraction*, and signifies that each Person ought to have 5 Ninths of a Piece of Eight more to his Share.

What hath been already said for Instruction, to divide by a single Figure, I think sufficient to any intelligent Person; and therefore shall only add some *Examples* for the Learner's Practice, and so proceed forward in the Rule.

Examples for Practice.

	<i>Divid.</i>		
<i>Divisor</i>	6)9654	7)4702	5)44044
<i>Quot.</i>	<u>1609</u>	<u>671$\frac{5}{7}$</u>	<u>8808$\frac{4}{5}$ Rem.</u>
	4)57802	9)345678	6)407060
	<u>14450$\frac{2}{4}$</u>	<u>38408$\frac{6}{9}$</u>	<u>67843$\frac{2}{6}$</u>

Divisor

Divisor 7)89012

Quot. 12716
7

Proof 89012

8)98765

12345 $\frac{5}{8}$

98765

9)4567097

507455 $\frac{2}{9}$

4567097

Note, There can be no shorter Way, nor a more regular Method of dividing by a single Figure, than by the Examples foregoing.

As in Multiplication, we multiply by 11 and 12 at once, to have the Product in one Line, so in this Rule is most expeditious and commendable to divide by the above-mentioned Numbers, as by a single Figure, as in the following Examples.

11)45678

Quotient 4152 $\frac{6}{11}$

12)42697

Quotient 3558 $\frac{1}{12}$
12

Proof 42697

11)379600

34509 $\frac{1}{11}$

12)3967040

330586 $\frac{8}{12}$
12

3967040

In the first Example I say, the Elevens in 45, 4 times; the Elevens in 16, once; the Elevens in 57, 5 times; the Elevens in 28, twice; and there remains 6; and the Quotient is 4152; as by the Example.

In the third Example, where I divide by 12, I say the Twelves in 42, 3 times; the Twelves in 66, 5 times; the Twelves in 69, 5 times; the Twelves in 7, 8 times, and there remains 1; and the Quotient is 3558; as by Example.

In like manner you may divide by these Numbers, viz. 110, 120, 1100, or 1200, &c. cutting off the Cypher, or Cyphers, with a downright Stroke of the Pen; and also as many Figures or Cyphers, towards the Right Hand, in the *Dividend*, which will be the Remainder, or Part of it, as in the following

Examples.

Divide by	11 08097 4	12 002880 00
Quotient	$\begin{array}{r} 736 \overset{14}{178} \\ 110 \end{array}$	$\begin{array}{r} 240 \end{array}$
Proof	$\begin{array}{r} 80974 \end{array}$	

VI. *Contractions*, or how to divide by 10, 100, 1000, or 10000, &c. so many Cyphers as you have in your *Divisor*, cut off with a Stroke so many Figures, or Cyphers from your *Dividend*, from the Right Hand towards the left; and the Work is done. The Figures on the Left Hand of the Stroke is the *Quotient*; and those on the Right the *Remainder*; as in these Examples.

$\begin{array}{c} \text{Q.} \\ \text{R.} \end{array}$	$\begin{array}{c} \text{Q.} \\ \text{R.} \end{array}$	$\begin{array}{c} \text{Q.} \\ \text{R.} \end{array}$
1 0)36 5	1 00)749 60	1 000)567 890
10	100	1000

$\begin{array}{c} \text{Quot.} \\ 1|0000)7496|4600 \text{ Remains.} \end{array}$

VII. When the *Divisor* consists of several Figures, then arises the greatest Difficulty in the Work of *Division*; but I shall give such plain Directions, which if heedfully attended, and observed, will render it very easy.

Example 1.

Example 1.

Let it be required to divide 78901 by 32. In order to the Work, I place the Numbers down with two crooked Lines, one behind the *Divisor*, and the other before the *Quotient*; thus:

Divid. Quotient.

Divisor 32)78901(. . . .

Thus I set out as many Figures towards the left Hand of the *Dividend*, as there are Places in the *Divisor*, by making a *Point* under 8, as above; then remembring the *General Rule*, viz. to *Seek, Multiply, and Subtract*, I begin, saying, how many times 3, the first Figure of the *Divisor*, can I have in 7, the first Figure in the *Dividend*, and the Answer is twice; wherefore I set down 2 in the *Quotient*, thus 32)78901(2. Then according to Rule, I multiply the *Divisor* 32 by 2, the times I take, saying, twice 2 is 4, which I set down under 8 in the *Dividend*; then twice 3 is 6, which I place under 7 in the *Dividend*; then I draw a Line, and according to Rule, subtract 64 from 78, and there remains 14; as in the first Step of the Work may be seen, standing thus:

32)78901(2

64

—

14

Then I make a *Point* under the next Figure, to wit, 9, and bring it down, setting it on the Right Hand of the *Remainder* 14; and then there is 149 for a new *Dividend*, and stands thus;

32)

$$32)78901(2$$

 64

 149

Then again I seek how oft I can have 32, the *Divisor*, in 149 the *Dividual*; but since that is too hard to reach by the Mind, there being one Figure more in the *Dividual* than in the *Divisor* (for there never ought to be more than one) I seek how often I can have 3, the first Figure of the *Divisor*, in 14, the two first Figures in the *Dividual*, and I find I can have it 4 times, wherefore I put 4 in the *Quotient*, and multiply the *Divisor* 32, by 4, the Figure placed in the *Quotient*, saying, 4 times 2 is 8, which I set under 9; then 4 times 3 is 12, which I put under 14, and then subtract 128 from 149, and there remains 21; (*Note*, After any *Subtraction*, there must never remain so much as the *Divisor*, for if there doth, you have made an Error, by taking a Time too little, which must be rectified before you proceed any further); then I make a Point under the next Place in the *Dividend*, which is a Cypher, and bringing it down, set it on the Right of the Remainder 21, and it makes 210, for a *Dividend*; after this second Step, the Work stands thus;

$$32)78901(24$$

 64

 149

 128

 210

Then again I seek how oft I can have 32, the *Divisor*, in 210, or how oft, (because there is one Figure more in the *Dividual*, than in the *Divisor*) I can have 3, the first

In the Divisor, out of 21, the two first Figures in the Dividual, and the Answer is 7 times: But I must observe, not to take the first Figure any more times than I can the next. Wherefore I try if I can take all the Figures 7 times, by multiplying 32 the Divisor by 7, and note the Product on Paper, or in my Mind, only by observing the two last Figures, whether it be not too big to subtract from the Dividual, and I find it is, for I cannot take 224 (the Product of 32 by 7) out of 210 the Dividual, wherefore I take a time less, viz. but 6, and put that in the Quotient, and say, 6 times 2 is 12, 2 and carry 1, and 6 times 3 is 18, and 1 is 19, and then I have 192 to take out of 210, and there rests 18. Then I make a Point under the last Figure of the Dividend, and bring it down to the Remainder 18, and it makes 181, and the Work stands thus;

$$32 \overline{) 78901} (246$$

$$\underline{64}$$

$$149$$

$$\underline{128}$$

$$210$$

$$\underline{192}$$

$$181$$

Then I seek how often I can have 32 out of 181, or how oft 3 in 18, and the Answer is 6 times; but on trial find that too much; and therefore I take but 5 times, and set 5 in the Quotient, and multiply the Divisor 32 by 5, and find that the Product is 160, to be subtracted from 181, and the Remainder is 21, and so the Work finished, and the Quotient is 2465, and the Remainder 21; which shews that 32 is contained in 78901, 2465 times, and 21 over. See the Work.

Dividend

Dividend
Divisor, 32)78901(2465 *Quotient*.

$$\begin{array}{r}
 64 \\
 \hline
 149 \\
 128 \\
 \hline
 210 \\
 192 \\
 \hline
 181 \\
 160 \\
 \hline
 (21) \text{ Remainder.}
 \end{array}$$

Example 2.

Divide 16790 Days by 365

Quotient.
 365)16790(46 Years

$$\begin{array}{r}
 1460 \\
 \hline
 2190 \\
 2190 \\
 \hline
 (0)
 \end{array}$$

In the *Example* above, I find I cannot take the first Figure of the *Divisor* out of the *Dividend*; wherefore I say, How often three in 16? Upon Trial, I find 5 times too much, wherefore I set 4 in the *Quotient*, and say 4 times 5 is 20; I set down 0 under 9, in the *Dividend*, and carry 2, saying, 4 times 6 is 24, and 2 is 26, 6 and carry 2; then 4 times 3 is 12, and 2 is 14; which Product of 1460 I subtract out of the *Dividend* 1679, and there remains 219, to which I bring down the Cypher out of the *Dividend*, and it makes 2190 for a *Dividend*, &c. See the Work above.

Example 3.

Example 3.

Divide 345678901 by 2345. In order to the Work, I set it down thus;

$$2345)345678901($$

In this Sum are four Places in the Divisor, wherefore I make a Point under the 4th Figure in the Dividend, viz. under 6 for my first Dividual; but if the first Figure in the Divisor had been bigger than the first in the Dividend, then I must have made the Point under the 5th Figure in the Dividend, to wit, under the 7; and then have tried how oft the first Figure in the Divisor could have been taken out of the two first Figures in the Dividend.

But to proceed, I first seek how oft I can have 2, the first Figure of the Divisor, out of 3, the first of the Dividend, which is once, wherefore I put one in the Quotient, and multiply the Divisor 2345 by 1, setting the Product just under the first Dividual, and subtract according to Rule, and then the Work stands thus:

$$2345)345678901(1$$

$$\underline{2345}$$

$$1111$$

Note, You must never bring down more than one Figure or Cypher at a Time out of the Dividend, and for every Figure or Cypher brought down, there must be one, or a Cypher put in the Quotient.

Then I make a Point under the next Figure in the Dividend, viz. 7, and bring it down, placing it on the Right of the Remainder 1111, and then I have 11117 for a Dividual, which contains one Figure more than the Divisor; wherefore I take the first Figure of the Divisor out

out of the two first Figures of the Dividual, *viz.* 2 out of 11, saying, the Two's in 11, 5 Times; but on Trial, I find I cannot take five times thro' the whole Divisor; for when I multiply the Divisor by 5, I find its Product to be 11725, which cannot be taken out of 11117, that is, I cannot take 117 out of 111, wherefore I take one less, and set 4 in the Quotient, by which I multiply the Divisor 2345, and find its Product 9380, which subtracted from 11117, leaves 1737 for the Remainder; to which I bring down the next Figure of the Dividend, *viz.* 8, and annex it on the Right Hand, and then there is 17378 for a Dividual, and the Work stands thus;

2345)345678901(14

2345

11117

9380

17378

Then I seek how oft I can have 2 in 17, and the Answer is 8 times, but on Trial I find it too much; wherefore I set 7 in the Quotient.

Note in general, *When you are upon Trial for the Times you can take, you need only mind the two last Figures of the Product towards the left Hand; for if you can take them out of the two first of the Dividual, it will most commonly bear the Times you take.*

Having set 7 in the Quotient, I multiply the Divisor by it, and the Product is 16415, which I subtract from 17378, and the Remainder is 963; to which I bring down the next Figure in the Dividend, *viz.* 9, and then I have 9639 for a Dividual, and then the Work will appear as follows.

2345)

2345)345678901(147

2345

11117

9380

17378

16415

9639

Here this last Dividual hath an equal Number of Figures with the Divisor, *viz.* Four; wherefore I seek how often I have 2, the first Figure of the Divisor, out of 9, the first of the Dividual, and the Answer is 4 times, which I put in the Quotient, and then multiply the Divisor by 4, and the Product is 9380, which subtracted from 9639, the Remainder is 259, to which I bring down the Cypher the next place in the Dividend, and then I have 2590 for a *Dividual*; then I seek again, and set 1 in the Quotient, by which I multiply the Divisor, and subtract according to Rule, and the Remainder is 245, to which I bring down the last Figure out of the Dividend, *viz.* 1, and then there is 2451 for the last *Dividual*, and then I seek again, and I find I can take but once; wherefore I set another 1 in the Quotient, and work as before, and I find the Remainder 6, and so the Work is finished, as by the whole operation in the following Page.

The Proof.

To prove the following Sum, or any other Sums in this Rule, multiply the Quotient by the Divisor, and if there be a Remainder, it must be taken in as you multiply, and if the Product is like the Dividend, the Work is right, as may also be seen in the *Example*.

2345)

2345)345678901(

2345

11117

9380

17378

16415

9639

9380

2590

2345

2451

2345

(106)

147411

2345

737061

589644

442234

294822

345678901 Proof.

$$\begin{array}{c} 5 \\ \times \\ 7 \end{array} \begin{array}{c} 2 \\ 0 \end{array} \left. \vphantom{\begin{array}{c} 5 \\ \times \\ 7 \end{array}} \right\} \text{Proof.}$$

In proving (after I have set the Divisor under the Quotient, as in the *Example*) I say 5 times 1 is 5, and 6 that remains in the Units Place of the Remainder, is 11, 1 and carry 1, &c. When I come to the third Figure in the Multiplier I take in the 1 that stands in the Place of Hundreds in the Remainder, as 3 times 1 is 3, and 1 is 4, &c.

Division may also be proved by the Cross, as in *Multiplication*: For Trial, let us prove the foregoing Sum thus:

First cast the Nines out of the Divisor, and there remains 5, which I place on the Left of the Cross (as you see in the Margin) then out of the Quotient and there remains 0, which I set on the Right of the Cross; then I multiply these two together, and they make 0; but the Nines must have been

cast out there also, if by multiplying them together they had made any, and what was over, carried to the *Remainder*, which here makes 7, which I set on the Top, as in the Margin. Lastly, I cast away the Nines out of the Dividend, and there rests 7 also, which I put underneath the Cross, and finding the Top and Bottom Figures to be alike, I conclude the Work is right.

The foregoing Directions to the preceding *Examples*, are so plain and easy, that there is no Occasion for any more; so I shall set down some more *Examples*, without any verbal Directions, thinking what hath been already said to that Purpose, to be sufficient.

More Examples.

Divisor 14)5873456(419532 Quotient

$$\begin{array}{r}
 56 \\
 \hline
 27 \\
 14 \\
 \hline
 133 \\
 126 \\
 \hline
 74 \\
 70 \\
 \hline
 45 \\
 42 \\
 \hline
 36 \\
 28 \\
 \hline
 (8)
 \end{array}$$

47)27072329(576007

$$\begin{array}{r}
 235 \\
 \hline
 357 \\
 329 \\
 \hline
 282 \\
 282 \\
 \hline
 329 \\
 329 \\
 \hline
 \end{array}$$

$$\begin{array}{c}
 5 \\
 2 \times 7 \\
 5
 \end{array}$$

(0) Remainder.

Divisor.

Divisor 426)7890123(18521

$$\begin{array}{r} 3 \\ 3 \times 8 \\ 3 \end{array}$$

426

$$\begin{array}{r} 3630 \\ 3408 \\ \hline \end{array}$$

2221

2130

912

852

603

426

(177)

96)7400900(77092

672

680

672

890

864

260

192

(68)

$$\begin{array}{r} 2 \\ 6 \times 7 \\ 2 \end{array}$$

Here follow some other Sums, with their *Quotients* and *Remainders* only; their Working being purposely omitted; leaving that to the Learner for a Trial of his Ingenuity.

As if you divide 796976499, by 49654, the *Quotient* will be 16050, and the *Remainder*, after the Work is ended, 29799.

Again, if you divide 5345678905, by 765432, the *Quotient* will be 6983, and the *Remainder*, 667249.

Also, if you divide 456789012345, by 9876543, the *Quotient* will be 46249, and there will be a *Remainder* of 8775138.

And if you divide 123456789012, by 123456789, there will be for the *Quotient* 1000, and for the *Remainder* 12.

And that nothing may be wanting to a perfect Understanding of this *Rule*, I have subjoined the following *General Notes*, concerning Division.

1st, So many Places as are in your *Divisor*, you point off so many in your *Dividend*, for your first *Dividual*, except

except the first Figure of the *Divisor* exceed the first of the *Dividend*, and then you move a Place farther towards the right Hand, and make your Point there; and then your *Dividual* marked out, hath a Figure more than your *Divisor*; and then you must take the first Figure of your *Divisor* out of the two first Figures of your *Dividual*.

2dly, You never place a Cypher in the *Quotient* the first time you seek.

3dly, The times that you take the *Divisor* out of the *Dividual* never exceed 9.

4thly, The *Dividual* never exceeds the *Divisor* above one Figure.

5thly, You never bring down but one Figure or Cypher at a time, out of the *Dividend*.

6thly, For every Figure or Cypher brought down from the *Dividend*, there must be one, or a Cypher placed in the *Quotient* also.

7thly, When you cannot take the *Divisor* out of the *Dividual*, you must put a Cypher in the *Quotient*, and take another Figure from the *Dividend*: And if, again, you cannot take it, place another Cypher in the *Quotient*, and then seek again.

8thly, When, at any time, after you have subtracted, there remains nothing, and yet there remains a Cypher, or Cyphers in the *Dividend*, it or them must be put in the *Quotient* as Part of it, and the Work is done; and there will be no Remainder.

The short ITALIAN Way of DIVISION.

There is another Way of *Division* shorter than the foregoing, because you omit setting down the several products of your *Multiplication*, but multiply and subtract together; and is like the common *Scratch* or *Cancelling Way of Division*, only you are not at the trouble of removing your *Divisor* every time you seek, in that Way you are.

Example.

Example.

Let us divide the second *Example* in Page 100, by this (as it is called) short *Italian Way*; viz. Divide 16790 Days by 365. In order to the Work, I set it down as before, thus;

$$365 \overline{) 16790(46}$$

$$\underline{2190}$$

$$(0)$$

Here I seek (as before) how oft I can have 3 in 16 (my Point being under 9, for the Dividual) and I find I can have but 4 times; wherefore I put 4 in the Quotient, and multiply the Divisor (as before) saying, 4 times 5 is 20, but I do not set down a 0, and carry 2, as in the other Way; for the Product must not be set down, as was said before, but forthwith subtract, saying, 4 times 5 is 20, 20 from 9 I cannot, but 20 from 29 (borrowing two Tens) and there remains 9, which I set under the Line; then 4 times 6 is 24, and two that I borrowed is 26, from 7 I cannot, but 26 from 27 and there remains 1, which I also set down; then 4 times three is 12, and 2 that I borrow is 14, from 16 and there remains 2, which I place under the Line; then there is a Remainder of 219, to which I bring down the Cypher out of the Dividend, and then I have the last Dividual 2190; then I say the 3's in 21, 6 times, by which I multiply the Divisor, saying, 6 times 5 is 30, from 0 I cannot, but 30 from 30 (borrowing 3 Tens) and there remains 0; then 6 times 6 is 36, and 3 that I borrowed is 39, from 9 I cannot, but 39 from 39 and there remains 0; then 6 times 3 is 18, and three that I borrowed is 21, from 21 and there remains 0, and so the Work is done.

Let

Let another *Example* be this: Divide 345678901 by 2345, which is the third *Example* in Page 101.

$$2345)345678901(1$$

$$11117$$

Here I say, once 5 is 5, from 6, and there remains 1, &c. then I bring down the 7, and set 4 in the Quotient, and say, 4 times 5 is 20, from 7 I cannot, but 20 from 27 and there remains 7. Then 4 times 4 is 16, and 2 that I borrowed, is 18, from 1 I cannot, but 18 from 21, and there remains 3. Then 4 times 3 is 12, and 2 is 14, from 1 I cannot, but 14 from 21, and there remains 7. Then 4 times 2 is 8, and 2 is 10, from 11, and there remains 1; so that there remains 1737, to which I bring down the next Figure 8, for the Dividual, and the Work stands thus:

$$2345)345678901(14$$

$$11117$$

$$17378$$

Again, I seek, and put 7 in the Quotient, and say, 7 times 5 is 35, from 8 I cannot, but 35 from 38, and there remains 3. Then 7 times 4 is 28, and 3 that I borrowed is 31, from 7 I cannot, but 31 from 37, and there remains 6. Then 7 times 3 is 21, and 3 that I borrowed is 24, from 3 I cannot, but 24 from 33, and there remains 9. Then 7 times 2 is 14, and 3 that I borrowed is 17, from 17, and there remains 0. Then I bring down the next Figure 9, and the Work appears thus:

$$2345)$$

2345)345678901(147

11117

17378

9639

Then I bring down the rest of the Figures, one after another, working as before, till the whole is finished in the following Manner.

2345)345678901(147411

11117

17378

9639

2590

2451

Remainder (106)

Thus have I explained both the *Italian* Ways of Division, leaving it to the Learner to use which he likes best. But my Method will be to pursue the first *Italian* Way thro' the remaining Part of this Book, it being very plain and easy to be understood.

There is a very short Way of Division [I think the shortest that can be] by Cancelling; and so I shall give one *Example* to shew its Brevity: My Design, in this Book, being not only to shew the most intelligible, but the nearest Way to the Bush in all the Rules.

Example.

Example.

$$\begin{array}{r} 22(1 \\ 472(4 \\ 142584(3 \\ \hline 6945407 \text{ by } 276 \end{array} \begin{array}{l} 25164 \\ 143 \end{array}$$

First I seek, and find I can take two times, and say, twice 6 is 12, from 4 I cannot, but 12 from 14 (the 4 being over the Point or Stop for the first Dividual) and there remains 2; then twice 7 is 14 and 1 is 15, from 19, 4; and twice 2 is 4 and 1 is 5, from 6, 1: And then there is 1425 for a new Dividual, &c. See the Work; the Quotient being 25164, and the Remainder 143.

VIII. When there is a Cypher, or Cyphers in the Divisor, towards the right Hand, you may cut it, or them off, with a downright Stroke of the Pen, and also do the same with as many Figures, or Cyphers to the Right of the Dividend; and then divide the remaining Figures of the Dividend by the remaining Figures of the Divisor, as if there had been no Cyphers in the Divisor, or Dividend; and what you cut off from the Dividend, is the Remainder or Part of it: For what remains after the Work is done, must be put to what you cut off from the Dividend, for the whole Remainder.

Examples.

$\begin{array}{r} 7694 \overline{) 06(320} \\ 72 \\ \hline 49 \\ 48 \\ \hline (1406) \end{array}$	By the short Italian Way. $\begin{array}{r} 345 \overline{) 0008092320(000(23456} \\ 1192 \\ \hline 1573 \\ \hline 1932 \\ \hline 2070 \\ \hline \text{Rem. } (0) \end{array}$
--	---

F

For

For the first of these *Examples*, there are two Cyphers in the Divisor, wherefore I cut off two Places from the Dividend, and divide 7694 by 24, and there remains 14 at the last; to which I bring down the two Places cut off, *viz.* 06, and annex them to the 14, for the whole *Remainder*, *viz.* 1406, and the Quotient is 320.

In the second *Example*, there are 3 Cyphers in the Divisor, which I cut off; and also as many in the Dividend, and divide by 345; and then the Work is done, and there remains nothing.

IX. Any division Sum, when the Divisor is such a Number that any two Digits or Numbers in the Multiplication Table, being multiplied together, do make it, *viz.* the Divisor, then such Sum may be done at two Divisions, or by Component Parts much sooner, and in fewer Figures than at one.

Examples.

Divide 16560 by 48.

At one Division.

48)16560(345

144

216

192

240

240

(0)

At two Divisions, or Component Parts

6)16560

8) 2760

345 Quotient.

Here the two Numbers in the Table, multiplied together, that make the Divisor, are 6 and 8, for 6 times 8 is 48, the Divisor; wherefore I divide the Dividend 6560 by 6, and the Quotient is 2760, which I divide by 8 the second Number, and the Quotient, by that, is the true Quotient sought, viz. 345, as in the common way.

Bring 1212288 Ounces of *Raw Silk*, into Pounds of 16 Ounces.

At one Division.

4)1212288(50512

120

122

120

28

24

48

48

(0)

At two Divisions, or Component

12)1212288

(Parts.

2) 101024

50512 Quot. sought

Here are eleven Figures Difference between one Way and the other.

F 2

More

More Examples.

At one Division.

72)488808(6789

432

568

504

640

576

648

648

(0)

By two Divisions, or Component

8)488808 (Part.

9) 61101

6789 Quotient.

Here, if I had taken 6 and 12 for my Divisors, they would have produced the same Quotient, for 6 times 12 is 72, as well as 8 times 9.

(56 the Divisor

7)18648

8) 2664

333 Quotient sought

(99 the Divisor

9)537768

11) 59752

5432

If there happen to be any Remainder, either in the first or second Division, or in both, yet the Quotient will be the same. But when there are Remainders, the Way to find the true Remainder, as if you divided at once, is to multiply the first Divisor by the last Remainder, taking in the first Remainder, if any be.

Of MONEY.

X. Now I will shew how to divide Pounds, Shillings and Pence, without reducing them any otherwise than in your Mind; and also how this Rule answers many Questions that seem to require a Recourse to the Rule of Three for their Solution.

Divide *l.* 12 *s.* 10 *d.* 6 among 5 Persons.

Divisor 5) 12 10 6 Dividend.

Each must have 2 *s.* 10 *d.* 1 $\frac{1}{5}$ Quotient or Answer.

Here I say the Fives in 12 twice, and there remains 2, which are two Pounds, (for the Remainder is always the same with the Dividend) or 40 Shillings, and 10 *s.* in the Shillings Place, is 50 *s.* the Fives in 50, 10 times, which I put in its Place, viz. under the place of Shillings. Then the Fives in 6, once, and there remains one; which is one Fifth of a Penny. So each Man must have 2 *l.* 10 *s.* 1 *d.* $\frac{1}{5}$ for his Share.

The Common Way.

The foregoing Work is much sooner done, and looks a great deal handsomer than that in the Margin; for there you are obliged to reduce the 12 *l.* 10 *s.* 6 *d.* into Pence, and then you divide by 5, and the Quotient gives the Pence each Person must have; and then them Pence are brought into Pounds, &c. The Sum above is proved by the brief Rules in Multiplication of Money, sufficiently shewn in that Rule, in the following Manner.

<i>l.</i>	<i>s.</i>	<i>d.</i>
12	10	6
20		
250		
12		
5)3006		
12) 601 ($\frac{1}{5}$		
2 0	5 0	(1
<i>l.</i> 2	10	1 $\frac{1}{5}$

l. 2 10 1 $\frac{1}{5}$ Each
5 Persons

l. 12 10 6 Proof

In this Excellent Method of *Division* of several Denominations (for *Weight* or *Measure* may be so divided as well as *Money*) whatever remains, you always bring it (in your Mind only) into the Quality of the next Denomination towards the Right Hand; and if there be any thing there, you take it in, and then seek, &c. as in the foregoing Sum, where I said the Fives in 12, twice, and there remained 2, which I turned into Shillings, (the Name of the next Denomination) which with the 10 Shillings in the Place of Shillings, make 50; then I say, the Fives in Fifty, &c.

8)
Again, Divide l. 67 09 4 among 8 Persons.

l. 08 08 8 Answer.

Here I say, the Eights in 67, 8 times, and there remains 3 l. or 60 Shillings, and 9 Shillings in the Place of Shillings, is 69, the Eights in 69, 8 times, and there remains 5 Shillings, or 60 Pence, and the 4 Pence in the Place of Pence, make 64; the Eights in 64, 8 times, and nothing remaining. So each must have l. 8 08 8 as by the Work above.

If 5 Gallons of Brandy cost l. 1 16 8 what is the Gallon?

A General Rule.

Divide the Money by the Quantity: and here I say, the Fives in 36, &c.

5) 36

$$\begin{array}{r}
 \text{l. s. d.} \\
 5) \quad 1 \quad 16 \quad 8 \\
 \hline
 \text{Answ.} \quad 0 \quad 07 \quad 4 \\
 \phantom{\text{Answ.}} \quad \quad \quad 5 \\
 \hline
 \text{Proof,} \quad 1 \quad 16 \quad 8
 \end{array}$$

If 9 Stone of Beef cost 16 6
 what is that a Stone ?

$$\begin{array}{r}
 9) \text{s. d.} \\
 16 \quad 6 \\
 \hline
 1 \quad 10 \quad \text{Answ.}
 \end{array}$$

If 9 Gallons of Arrack cost
 what is that a Gallon ?

$$\begin{array}{r}
 9) \\
 \text{l.} \quad 4 \quad 08 \quad 01 \quad \frac{1}{2} \\
 \hline
 \text{Answ.} \quad 0 \quad 09 \quad 09 \quad \frac{1}{2}
 \end{array}$$

If 11 C. of Hops cost
 What is that per C. ?

$$\begin{array}{r}
 11) \\
 \text{l.} \quad 53 \quad 01 \quad 06 \\
 \hline
 \text{Answ.} \quad 4 \quad 16 \quad 06
 \end{array}$$

If the Charge of a Country Feast amounts to 314 l. 16 s. 8 d. and it is to be paid by 12 Stewards, what must each Steward pay ?

$$\begin{array}{r}
 12) \\
 \text{l.} \quad 314 \quad 16 \quad 8 \\
 \hline
 \text{Each must pay} \quad \text{l.} \quad 26 \quad 04 \quad 8 \quad \frac{1}{2} \quad \frac{8}{12} \\
 \hline
 314 \quad 16 \quad 8 \quad \text{Proof.}
 \end{array}$$

F 4

XI. As

XI. As in Division of one Denomination, according to the 9th Rule of this Chapter, where two Numbers in the *Multiplication Table* make the Divisor, being multiplied together, the Work might be performed at two Divisions; so in Division of several Denominations, the Work may be done after the same Method, following the Directions given in the said 9th Rule.

Example.

A Reckoning of £. 6 00 0 among 32 Men, what must each Man pay?

$$\begin{array}{r} 4) \text{ £. } 6 \quad 00 \quad 0 \\ \hline \end{array}$$

$$\begin{array}{r} 8) \text{ £. } 1 \quad 10 \quad 0 \\ \hline \end{array}$$

Each pays 0 03 9

Here the two Numbers are 4 and 8, therefore I first divide by 4, and then that Quotient by 8; or first by 8, and then by 4, it will be all one.

If 56 lb. of Coffee cost
what is that a Pound?

$$\begin{array}{r} 7) \\ \text{£. } 21 \quad 11 \quad 8 \\ \hline \end{array}$$

$$\begin{array}{r} 8) 03 \quad 01 \quad 8 \\ \hline \end{array}$$

Here 7 times 8 make 56 the Quantity.

Answ. 00 07 8 $\frac{1}{2}$

Divide £. 32 12 6 between 100 Persons.

$$\begin{array}{r} 10) 3 \quad 05 \quad 3 \\ \hline \end{array}$$

0 06 6 $\frac{3}{10}$ each

If 72 Gallons of Wine cost
what a Gallon?

$$\begin{array}{r} 8) \\ \text{L. } 19 \quad 4 \quad 0 \\ \hline 9) 2 \quad '8 \quad 0 \\ \hline \end{array}$$

Answer 0 5 4

If 81 lb. of Nutmegs cost
what a Pound?

$$\begin{array}{r} 9) \\ \text{L. } 49 \quad 17 \quad 3 \frac{3}{4} \\ \hline 9) 5 \quad 10 \quad 9 \frac{3}{4} \\ \hline \text{Answ. } 0 \quad 12 \quad 3 \frac{3}{4} \end{array}$$

If 45 C. of Hops cost
what 1 C. Weight?

$$\begin{array}{r} \text{L. } 5) 120 \quad 07 \quad 6 \\ \hline 9) 24 \quad 01 \quad 6 \\ \hline \text{Answ. } \text{L. } 2 \quad 13 \quad 6 \end{array}$$

A general Rule for Weight.

Having the Price of a C. Weight, to know the Price
of a Pound. Divide by 7 and 8, (7 times 8 being 56,
the Half Hundred Weight) and take the Half of the last
Quotient, which will be the Answer.

Examples.

If 112 lb. of Cast Iron cost
what a Pound?

$$\begin{array}{r} 7) \text{ s. } d. \\ 2 \quad 4 \\ \hline 8) 4 \\ \hline \frac{1}{2} \\ \hline \end{array}$$

The Half of a Half-penny is

$\frac{1}{4}$ Price of a lb.

F 5

18

If 112 lb of Lead cost
what a Pound?

$$\begin{array}{r} 7) \\ 7s. \\ \hline 8) 1 \\ \hline 1 \frac{1}{2} \end{array}$$

The Half is $\frac{3}{4}$

If 112 lb. of Sugar cost
what a Pound?

$$\begin{array}{r} 7) \\ l. 1 \quad 17 \quad 4 \\ \hline 8) 05 \quad 4 \\ \hline 8 \end{array}$$

The Half of 8 is 4 d. Answer.

If 112 lb. of Currants cost
what a Pound?

$$\begin{array}{r} 7) \\ l. 3 \quad 10 \\ \hline 8) 10 \\ \hline 1 \quad 3 \end{array}$$

The Half of 15 d. is $7 \frac{1}{2}$

So at any time, in any Division Sum, if the Divisor be 112, the Quotient is soon found by this Way of Division by Parts.

I will leave one *Example* also by the common Way to shew the Tediousness of the one, and the Expedition of the other.

The

H
and
the

The Common Way.

Divide *l.* 1476 19 8 $\frac{3}{4}$ between 27 Persons.

$$\begin{array}{r} 20 \\ \hline 29539 \\ 12 \\ \hline 354476 \\ 4 \\ \hline \end{array}$$

27)1417907 *Farthings.* 4)52515 *Farthings each.*

$$\begin{array}{r} 135 \\ \hline 67 \\ 54 \\ \hline 139 \\ 135 \\ \hline 40 \\ 27 \\ \hline 137 \\ 135 \\ \hline (2) \end{array}$$

$$\begin{array}{r} 12)13128 \frac{3}{4} \\ \hline 2|0)109|4 \end{array}$$

Answer, l. 54 14 0 $\frac{3}{4}$

The other Way.

l. 3)1476 19 8 $\frac{3}{4}$

9) 492 06 6 $\frac{3}{4}$ $\frac{1}{3}$

Answer, l. 54 14 0 $\frac{3}{4}$

Here is a prodigious Difference between one Way and the other, one having almost 60 Figures more in the Work than the other.

Note,

Note, That Weight and Measure may be divided by Parts as Money.

Examples.

If 42 Bags of *Spanish* Wool weigh
what 1 Bag?

6) C. qrs. lb.
110 1 00

7) 18 1 14

Ans. 2 2 14

If 45 Pieces of Linen contain
what one Piece?

9) Yds. qrs. Nh.
2157 0 3

5) 239 2 3

Ans. 47 3 3



C H A P. VI.

R E D U C T I O N,

IS wholly performed by *Multiplication* and *Division*; and teaches to bring or change Numbers of one Denomination, into Numbers of another, without the least Alteration of Value, tho' in different Terms. For Instance:

Suppose I am to bring 20 *l.* into Farthings, which when I have done, the Work will produce 19200 Farthings,

things, which are equal in Value to *l. 20*: For when they are reduced rightly back again, the last Quotient will precisely produce *l. 20*, neither more or less.

II. All great Names are brought into smaller, of equal Value, by *Multiplication*; that is, by multiplying the given Number by as many of the next lesser Name, as make one of that greater: As *Pounds* into *Shillings*, *Pence* or *Farthings*: Or, *Tuns Weight* into *Pounds Weight*, &c.

III. All small Names are brought into greater of equal Value, by *Division*: That is, by dividing the given Number by as many of the lesser as make one of the next greater Name: As *Farthings* into *Pence*, *Shillings* or *Pounds*: Or, *Pounds Weight* into *Quarters*, *Hundreds*, or *Tuns Weight*.

Example 1.

In 20 <i>l.</i> how many Farthings?	20 <i>s.</i>
20 Shillings make a Pound.	12
400 Shillings in 20 <i>l.</i>	Pence, 240 in a Pound
12 Pence make 1 <i>s.</i>	4
4800 Pence in 20 <i>l.</i>	Farth. 960 in a Pound
4 Farthings, one Penny.	Or thus:
19200 Farthings in 20 <i>l.</i>	20 <i>l.</i>
	960 Farthings in
	a Pound.
	Farths. 19200 Answer.

In the Question above, it is required to bring *Pounds* into *Farthings*, which is a great Name to be brought into a smaller; which according to the II^d Rule of this Chapter, is to be done by *Multiplication*. Wherefore, as is there directed, I multiply the given Number 20 *l.* by 20, the

the Shillings in a Pound, and the Product is the Shillings in 20 *l.* Then them Shillings by 12, the Pence in a Shilling, and the Product is the Pence in 20 *l.* and them Pence by 4, the Farthings in a Penny, and that Product is the Farthings in 20 *l.* and the Answer to the Question, as may be seen by the preceding Work.

Or, as before, I multiply the 20 *l.* by 960, the Farthings in a Pound, but I multiply 960 by 20, tho' the 20 be uppermost to save Room: for at any Time the *Multiplier* may be multiplied by the *Multiplicand*; for the Product will be the same either Way.

By the foregoing Methods are all *Reductions* descending, (that is, from greater Denominations to lesser) work'd, whether they be *Money*, *Weight*, or *Measure*. That is, by considering how many of the next lesser, make a Unit, or one of the foregoing greater Denominations, as before directed; and then multiply accordingly, descending from one Denomination to the next, till the Work is finished. And for further Assistance, respect must be had to the several Tables of Quantity in *Money*, *Weight* and *Measure*, in the II^d Chapter of this Book.

Pounds multiplied by 20 produce Shillings; Shillings multiplied by 12 give Pence, Pence multiplied by 4 produce Farthings.

Farthings divided by 4 are Pence, Pence divided by 12 quote Shillings, Shillings divided by 20 are Pounds.

Example. 2.

In 19200 Farthings, how many Pounds?

$$\begin{array}{r} 4 \overline{) 19200} \\ \underline{12} 4800 \\ \underline{2} 40 0 \end{array}$$

l. 20 Answer.

$$\begin{array}{r} \text{Or thus:} \\ 96 \overline{) 019200} (20 \text{ } l. \\ \underline{192} \\ (0) \end{array}$$

Here

Here it is required to bring Farthings into Pounds; which is a small Name into a greater; and therefore according to the III^d Rule of this Chapter, it is done by Division; wherefore I divide the given Number, 19200 by 4, the Farthings in a Penny, and the Quotient is Pence, and them Pence I divide by 12, the Pence in a Shilling, and the Quotient is Shillings; and them Shillings I divide by 20, the Shillings in a Pound, and the Quotient is Pounds; to wit, 20*l.* and is a sure Proof of the foregoing *Example*.

Or I divide the 19200 Farthings by 960, the Farthings in a Pound, and the Quotient is the same, viz. 20*l.*

Example 3.

In 576*l.* how many Shillings, Pence, and Farthings?

By 20

11520 Shillings

By 12

138240 Pence.

By 4

552960 Farthings.

(This is a great Name to be brought into a smaller, and therefore I multiply)

Example 4.

In 552960 Farthings, how many Pence, Shillings, and Pounds?

$$\begin{array}{r} \text{Divide by } \left\{ \begin{array}{l} 4 \overline{) 552960} \\ 12 \overline{) 138240} \\ 20 \overline{) 11520} \end{array} \right. \end{array}$$

l. 576 Answer and Proof.

This

This is the Reverse of the 3d *Example*, and a small Name to be brought into a great, and therefore I divide and find *l.* 576 the Answer and Proof to the said *Example*; for *Reduction* ascending proves *Reduction* descending; and so the contrary.

☞ *Note*, When you are to bring *Shillings* into *Pounds*, (let the Number be what it will) cut off the last Figure, or Cypher, towards the Right Hand, and halve the other towards the Left, (which is dividing by 20, but shorter) and that Half shall be *Pounds*, and the Figure cut off is *Shillings*: And if any thing remain after the halving of the last Figure, which is never more than one, it must be joined to the Figure, or Cypher cut off; as in the 4th *Example* foregoing, and in the following, viz.

Bring 423|7 *Shillings* into *Pounds*.

l 211-17

Here the $\frac{1}{2}$ of 4 is 2, the $\frac{1}{2}$ of 2 is 1, and the $\frac{1}{2}$ of 3 is 1, and there remains 1, which is 1 Ten, which must be put to the 7 cut off, and it makes 17 s. So the whole is *l.* 211 17s. as above. By the same Method may *Hundreds Weight* be reduced into *Tuns*.

A General Rule.

When you have *Pounds* to be reduced into *Farthings*, multiply by 20, by 12, and by 4; or by 960, the *Farthings* in a *Pound*.

When you have *Farthings* to be reduced into *Pounds*, divide by 4, by 12, and by 20, or 960.

If *Pounds* are to be brought into *Pence*, multiply by 240, the *Pence* in a *Pound*: if the contrary, divide by 240.

Example,

Example 5.

Reduce 476 *l.* into Pence,

240

19040

952

Pence 114240

Here I multiply by 12, and by 2, twice
12 being 24; and
for the Cypher I
add it at the last.

Or thus: *According to the 8th Rule of Chap.*
476 12 4.
5712 2

114240 Pence.

Reduce 114240 Pence into Pounds, by dividing by 240

24|0)11424|0(476 *l.* Answer.

96

182

168

144

144

(0)

Or thus:

12)11424|0

2)952

l. 476 Answer.

Here, in the second Way, after I have cut off a Place from the *Dividend*, for the *Divisor's* Cypher, I divide by 12, and by 2, which multiplied together, make 24, and for the Cypher to make it 240, there's a Place cut off from the *Dividend*; so that I divide only by 12, and by 2, according to the IXth Rule of the foregoing Chapter: See the Work above.

By the second Way there are many Figures, and much Trouble saved; as may be seen by comparing one Way with the other.

Example

Example 6.

Bring 476 Pounds into Farthings, by multiplying by

$ \begin{array}{r} 960 \\ 476 \\ \hline 5760 \\ 6720 \\ 3840 \\ \hline \text{Farthings } 456960 \end{array} $	Or thus: $ \begin{array}{r} l. \ 476 \\ 8 \\ \hline 3808 \\ 12 \\ \hline \text{Farthings } 456960 \end{array} $
--	--

In the second Way I multiply by 8, and by 12, according to the VIIIth Rule of the IVth Chapter, 8 times 12 making 96, and I add the Cypher at the last.

Example 7.

Bring 456960 Farthings into Pounds by dividing by 96|0)45696|0(476 l. Answer.

$ \begin{array}{r} 384 \\ \hline 729 \\ 672 \\ \hline 576 \\ 576 \\ \hline (0) \end{array} $	Or thus: $ \begin{array}{r} 8)45696 0 \\ \hline 12)5712 \\ \hline l. \ 476 \text{ Ans.} \end{array} $
--	--

IV. When the Sum to be reduced consists of several Denominations; as Pounds, Shillings, and Pence, or Tuns, Hundreds, Quarters, and Pounds, then you must multiply as before; but you must take in the Shillings, Pence, or Farthings, that stand in each Denomination, as you reduce the higher Name to the next inferior.

Example

Example. 8.

In $l. 426 \ 19 \ 8 \frac{1}{2}$ how many Farthings?20

8539 Shillings.

12

102476 Pence.

4

409906 Farthings. Answer.

Here I multiply first by 20, saying, 06 is nothing, but 9 that stands in the Unit's Place of Shillings, is 9; then twice 6 is 12, and 1 that stands in the Tens Place of Shillings is 13, 3 and carry 1, &c. Then, when I come to reduce the Shillings into Pence, I say 12 times 9 is 108, and 8 that stands in the Place of Pence is 116, 6, and carry 11, &c. Then when I reduce the Pence into Farthings, I say, 4 times 6 is 24, and 2 that stand in the Place of Farthings is 26, 6 and carry 2, &c. See the Work.

Example 9.

In $4) 409906$ Farthings, how many Pence, Shillings, (and Pounds?)d.
12)102476 $\frac{1}{2}$ s.
2|0)853|9-8 d.l. 426-19-8 $\frac{1}{2}$ Answer and Proof.

I first

I first divide by 4, and there remains $\frac{1}{2}$ that was taken in; then by 12, and there remains the 8 *d.* taken in; and then by 20, (or cut off the last Figure, and halve the other, as before directed, to bring Shillings into Pounds) and there remains the 19 Shillings taken in.

Example 10.

In $\begin{array}{r} 4) \\ 2403590 \end{array}$ Farthings, how many Pounds, &c.

$12)600897 \frac{1}{2}$ Here I divide by 4, by 12, and by 20, according to the foregoing general Rule.

$2)0500714-9d.$

$\text{L. } 2503-14-9 \frac{1}{2}$

Example 11.

In $\text{L. } 2503-14-9 \frac{1}{2}$ how many Farthings?

20

50074

12

600897

4

2403590 Farthings

These two Sums are a Proof to each other.

In 30 Marks, and 40 Groats, and 50 English Crowns, How much in Value is their Worth intrinsically in Pounds?

Ans. $\text{L. } 33-3-4$.

Example

Example 12.

In l. 742 14 6 how many Pence?

20

14854

12

178254 Answ.

Here I multiply by 20, and take in the 14 s. and then by 12, and take in the 6 d. according to the IVth Rule of this Chapter.

Example 13.

In 12) 178254 Pence, how many Pounds, &c.

2|0) 1485|4-6

l. 742 14 6 Answer.

In l. 759 17 8 $\frac{1}{2}$ how many Halfpence?

Answer 364745

Multiply by 20, 12, and 2.

Bring 364745 Halfpence into Pounds, &c.

Divide by 2, 12, and 20.

Or Halfpence may be brought into Pounds by dividing componently, by 480, and Pounds into Halfpence by multiplying by 480.

In l. 529 12 6 $\frac{3}{8}$ how many Eights of a Penny?

Answer 1016885.

Multiply by 20, 12, and 8, taking in, &c.

Bring

Bring 1016885 Eights of a Penny into Pounds, &c.

Divide by 8, 12, and 20.

Any Number of Pence may be brought into Pounds, Shillings, and Pence, at one Working, thus. Add a Cypher to the given Number, and divide them by 240, as usual, doubling the last Figure of the Quotient for Shillings, and the Remainder is Pence: As for *Example*: Bring the foregoing 13th *Example*, viz. 178254 Pence into Pounds, Shillings, and Pence, at one Work.

24|0) 178254|0 (742-7

168

— fac. 742-14-6

102

96

—

65

48

—

174

168

—

Rem (6) 1. 742-14-6

Here the last Figure, 7 doubled, is 14 s. and the 6 d. remains.

Or thus:

12)178254

—

2)1485|4-6

—

1. 742-14-6

Here I omit the Cypher, because I neglect it in the Divisor.

So likewise may Farthings be brought into Pounds, Shillings, Pence, or Farthings at one Work, by adding a Cypher, and dividing by 960, doubling the last Figure of the Quotient for Shillings, as above.

Example.

Example

In 39291 Farthings, how many *l. s. d.* and *qrs*?

Answer, l. 40 18 6 $\frac{3}{4}$

9610392911040

2

2

384

 l. 40 18 6 $\frac{3}{4}$ Anfwer.

891

864

(27) *qrs.* is $6d. \frac{3}{4}$

Or you may omit adding the Cypher to the given Number, since you cut off the Cypher from your Divisor; but you must not forget to double the last Figure. Or it may be done at two Divisions, thus :

8)39291

12)4911 3/8

40-9 $\frac{3}{12}$

2

Facit, l. 40 18 6 $\frac{3}{4}$

The first Remainder is $\frac{3}{4}$, and the last three Two-Pences.

Or by multiplying the first Divisor 8, by the last Remainder 3, taking in the first Remainder 3, (as the Rule in *Division* by Component Parts directs) makes 27 Farthings, equal to 6d. $\frac{3}{4}$

Of

Of COINS.

Here the several Species of *Coin* must be reduced into one Name, whether Shillings, Pence, or Farthings; and then divide the greater Number by the lesser, and the Quotient will be the Answer.

Example 1.

In *l.* 262 04 6 *Sterling*, how many Dollars, at

$$\begin{array}{r} 20 \\ \hline 5244 \\ 12 \end{array}$$

$$\begin{array}{r} 4s. \ 3d. \ \textit{Sterling} \\ 12 \\ \hline \end{array}$$

 Divisor 51 Pence.
 Doll.
 51)62934 Pence. (1234 Answer.

As above directed, I reduce the Dollar into Pence, and it makes 51; and then also the *l.* 262 04 6 into the same Name, *viz.* Pence; and they are 62934, which I divide by 51, the Pence in a Dollar; and the Quotient is the Answer, *viz.* 1234 Dollars.

Example 2.

In 1234 Dollars, at 4s. 3d. how many *l.* *Sterl.*

$$\begin{array}{r} 51 \\ \hline 1234 \\ 6170 \end{array}$$
 Multip. 51 Pence
 Here I multiply the Number of Dollars by the Pence in one; and the Product is the Pence that are in them all; which I divide by 12, and by 20, which brings those Pence into Pounds.

$$\begin{array}{r} 12)62934 \text{ Pence.} \\ \hline 2|0)524|4 \ 6 \\ \hline \end{array}$$

 Ans. *l.* 262 04 6

Example.

Example 3.

In *l.* 562-18 how many *French Crowns* at
 20 (54 *d.* $\frac{1}{8}$ per Crown.
 8

 11258

 12

 433

 135096

 8

 Crowns

433)1080768(2496 Answer.
 866...

 2147

 1732

 4156

 3897

 2598

 2598

 (0)

Here I first bring the Crowns into Eights, by multiplying by 8, and taking in the 1 over the 8; and then I do the same, by *l.* 562-18, that the *Dividend* and *Divisor* may be of the like Name; and then I divide the one by the other, and the Quotient gives the Answer, viz. 2496 Crowns.

G

Example.

Example 4.

In 2496 French Crowns, at 54 d. $\frac{1}{8}$ per Crown, how many l. Sterl. 8

$$\begin{array}{r} 433 \\ \hline 7488 \\ 7488 \\ \hline 9984 \end{array}$$

8)1080768 Eights.

$$\begin{array}{r} 12)135096 \\ \hline \end{array}$$

$$\begin{array}{r} 2|0)1125|8 \\ \hline \end{array}$$

l. 562-18 Answer and Proof to the above Quest.

Example 5.

In 426 Pistoles at 17 s. each, how many Guineas at

$$\begin{array}{r} 204 \\ \hline 12 \end{array} \quad \begin{array}{r} 21 \text{ s. } 6 \text{ d.} \\ \hline 12 \end{array}$$

$$\begin{array}{r} 1704 \text{ Pence} \\ \hline 8520 \end{array} \quad \begin{array}{r} 204 \text{ Multiplier} \\ \hline \end{array} \quad \begin{array}{r} \text{Divisor} \\ \hline 258 \text{ d.} \end{array}$$

Guin. 258)86904(336 $\frac{2}{5}$ $\frac{1}{8}$ Answ.

$$\begin{array}{r} 774 \\ \hline \end{array}$$

$$\begin{array}{r} 950 \\ \hline \end{array}$$

$$\begin{array}{r} 774 \\ \hline \end{array}$$

$$\begin{array}{r} 1764 \\ \hline \end{array}$$

$$\begin{array}{r} 1548 \\ \hline \end{array}$$

$$\begin{array}{r} (216) \end{array}$$

Here the Pence in 426 Pistoles, are divided by the Pence in a Guinea, and the Quotient is the Answer, viz. 336 Guineas, and 216 Pence over, which is 18 Shillings.

Example

Example 6.

In 336. Guineas, and 216 Pence, how
Pence in a Guinea 258 (many Pistoles at 17 s. each?

$$\begin{array}{r}
 2688 \\
 1680 \\
 672
 \end{array}
 \qquad
 \begin{array}{r}
 12 \\
 \hline
 \text{Divisor } 204
 \end{array}$$

216 Pence that remained.

— Pistoles

204)86904(426 Answer and Proof to the
 816 (foregoing Question.

530

408

1224

1224

(0)

Pistoles of 17 s. are brought into Guineas of 21 s. by
 multiplying by 17, and dividing by 21.

Example 7.

In 436 Pistoles, how many Guineas?

Answer 352 $\frac{20}{21}$. That is, 353 Guineas, wanting 1 s.

Guineas into Pistoles, by the contrary Practice.

Broad pieces at 23 s. are brought into ditto at 25 s.
 by taking $\frac{1}{4}$ part, viz. 246 pieces, at 23 s. amount to
 82 l. 18 s. the $\frac{1}{4}$ of which gives 61 l. 10 s. that is, of
 46, which put to 246 pieces, makes 307 l. 10 s. the
 value of 246 broad pieces at 25 s.

Example 8.

In 1546 Pieces of Eight, at 4 s. 6 d. how many
 54 Pence in one 12 (l. Sterling.)
 Piece of $\frac{8}{8}$

6184
 7730
 54

12)83484 Pence in them all.

2)0695|7

l. 347-17 Answ.

Or this Question may be done by *Multiplication of Money*, according to the Method taught in that Rule, thus:

1546 Pieces of $\frac{8}{8}$ at s. d.
 4 6
 10

l. 02 05 0 The Value of 10
 10

22 10 00 of 100
 10

1000—225 00 0
 500—112 10 0
 40—009 00 0
 6—001 07 0

Answ. 1546 l. 347 17 0

Example 9.

Marl

Example 9.

In *l.* 497-06-8 how many Marks at 13 s. 4 d?

$$\begin{array}{r}
 20 \\
 \hline
 9946 \\
 12 \\
 \hline
 \text{Marks.} \\
 16|011936|0(746 \text{ Answ,} \\
 112 \cdot \cdot \\
 \hline
 73 \\
 64 \\
 \hline
 96 \\
 96 \\
 \hline
 (0)
 \end{array}$$

$$\begin{array}{r}
 12 \\
 \hline
 \text{Divisor } 160 \\
 \hline
 \end{array}$$

Or thus;

$$\begin{array}{r}
 4)11936 \\
 \hline
 4)2984 \\
 \hline
 \end{array}$$

Answ. 746 Marks.

Here 4 times 4 is 16, omitting the Cypher in the Divisor, and therefore cut off one from the Dividend.

Example 10.

In 746 Marks at 13 s. 4 d, how many Pounds?

$$\begin{array}{r}
 160 \\
 \hline
 44760 \\
 746 \\
 \hline
 \end{array}
 \qquad
 \begin{array}{r}
 12 \\
 \hline
 160 \\
 \hline
 \end{array}
 \qquad
 \begin{array}{r}
 12)119360 \\
 \hline
 2|0)994|6-8d. \\
 \hline
 \end{array}$$

119360 Pence.

l. 497-6-8 Anf.

Or Marks, or any thing else at 13 s. 4 d. are brought into Pounds, &c. by multiplying by 2, and dividing by 3, and what remains will be one or 2 Nobles.

Pounds Shillings and Pence are brought into Marks by adding $\frac{1}{2}$, as by Example the 9th.

In *l.* 497 06 8 how many Marks?

$$\begin{array}{r}
 248 \\
 13 \\
 4 \\
 \hline
 \end{array}$$

Marks 746 Answ.

G 3

Again

Again, Marks are brought into Pounds by deducting $\frac{1}{3}$, *Example* the 9th.

In 746 00 0 Marks, how many Pounds?
248 13 4 The $\frac{1}{3}$ to be deducted.

l. 497 06 8 Answer, and Proof to the Example above.

The 10th Example foregoing may be done by *Multiplication*, thus:

746 Marks at	13 4	
	10	
Or thus:		
746	<i>l.</i> 6 13 4	{ Value of 10 Marks.
4	10	
2984	66 13 4	{ Ditto 100 Marks.
4	7	
12)119360	466 13 4	{ Ditto 700 Ditto 40 Ditto 6
	26 13 4	
	4 00 0	
2 0)994 6-8		
<i>l.</i> 497 06 8 <i>Ans.</i>	<i>l.</i> 497 06 8	746

In the Example on the Left Hand, after I have multiplied by 4 and by 4, I annex a Cypher, to make the last Product Pence; in regard that there's a 0 in 160, the Pence in a Mark.

Example

Example 11.

In l. 389 10 how many Florins at 3 s. 2 d.

20

12

7790

38 d.

12

Florins.

38)93480(2460 Answer.

76...

174

152

228

228

(0)

Example 12.

In 2460 Florins, at 3 s. 2 d. how many l. Sterling?

38

12

19680

38 Pence.

7380

12)93480 Pence.

2|0)779|0

l. 389 10 Answer and Proof.

At any time when you can discover how many of one sort of Pieces, or Coin, are equal to any Number of the other; the Example is speedily done by multiplying by the lesser, and dividing by the greater Number. Example, In 542 4 d. $\frac{1}{2}$ how many 13 d. $\frac{1}{2}$? Multiply by 3 and divide by 9. Answ. $180\frac{6}{9}$ pcs. there being three 4 d. $\frac{1}{2}$, in 13 d. $\frac{1}{2}$, and 9 Halfpence in 4 d. $\frac{1}{2}$.

G 4

Example

Example 13.

In 2712 Guilders at 2 s. each, how many Rix-Dol-
 96 (lars at 4 s. 5 d. $\frac{1}{2}$?)

16272	Half-Pence	48 in 2 s.	12
24408		2	53
		—	4

214)260352(1216 Rix-D.) qrs. 96 in a Gil. —

214 . . .

214 qrs. in a
(Dollar.

463

428

355

214

Here the Answer is, 1216 Rix-Dollars, and 128 Farthings Remainder, or 2 s. 8 d.

1412

1284

(128)

Pounds are brought into Guineas by multiplying by 20, and dividing by 21; thus :

In 730 *l.* how many Guineas?

20

7) 14600

S.

3) 2085 5

Answer 695 Guineas and 5 s. over.

In

In 695 Guineas, and 5s. how many pounds?

Guin.	s.	
695	5	
7 and 3 multiply by		
4865	}	The 5 Shillings taken in.
3		
2 0)1460 0		

l. 730 Proof.

Example 14.

In 798l. how many Nobles, Marks,
Nobles in 20s 3 Crowns, Shillings, Pence,
and Farthings?

Nobles 2)2394

Marks 1197

798
Crowns in a Pound 4

Crowns 3192

Shillings in a Crown 5

Shillings 15960

Pence in a Shilling 12

Pence 191520

Farthings in a Penny 4

Farthings 766080

I bring the Nobles into
Marks, by dividing them
by 2, because 2 Nobles
make a Mark.

Examples at large.

In *l.* 74622 17 6 how many Half-Crowns?

Multiply by 8, and take in 7. Answ. 596983.

In *l.* 22740 13 4 how many Nobles?

Multiply by 3, and take in 2. Answ. 68222.

In 76543 *Bitts* of *Jamaica*, each 7 *d.* $\frac{1}{2}$ *Sterling*, how many Pounds *Sterling*? Answ. *l.* 2391 19 4 $\frac{1}{2}$.

In *l.* 1725 19 4 *Sterling*, how many *Spanish* Dollars at 4 *s.* 4 *d.* Answ. 7966.

In 279623 Millreas of *Portugal*, at 5 *s.* 3 *d.* $\frac{1}{4}$, how many Pounds *Sterling*? Answ. *l.* 73692 06 2 $\frac{3}{4}$.

In 1276 Moidores, at 26 *s.* 6 *d.* how many Guineas, at 21 *s.* Answ. 1610 2 $\frac{8}{7}$.

In 150000 *Crusadoes*, each 400 *Reis*, 1000 *Reis* to a Millrea, at 5 *s.* 6 *d.* *Sterl.* how many Pounds *Sterling*? Answ. 16500.

In *l.* 3400 how many Crowns, Half-Crowns, Shillings, Groats, and Three Pences, and of each the same Number?

Answer 7486 Pieces of each Sort, and 26 *d.* over.

Avoirdupois.

Avoirdupois-Weight.

In reducing this Weight, *Troy-Weight*, or of *Measure*, *Time*, &c. you must be acquainted with the *Tables of Quantity*, &c. in the 2d Chapter of this Book.

Example 1.

Tuns. C. grs. lb.

In 24 14 3 15 how many Pounds Weight?
20 C. Tun

494 Hundreds Wt.

4 *Qrs.* 1 C.

1979 Quarters
28 lb. 1 gr.

15837

3959

Anf. 55427 Pounds.

Here are great Names to be brought into smaller, and therefore to be done by *Multiplication*; wherefore I multiply, according to the Table in the aforementioned Chapter, *viz.* by 20, by 4, and by 28; taking in the odd Weight in each Denomination, as in *Reduction of Money*; and the last Product is the Answ. *viz.* 55427 lb.

Example 2.

Example 2.

28)
In 55427 Pounds, how many Tuns, &c.

28

274

252

222

196

267

252

(15)

4)1979

2|0)49|4-3

Tuns. 24 14 3 15 Answ.

Here I proceed reverfely, dividing by 28, by 4, and by 20. Or this *Divifion* Sum may be done by 4 and 7, the component Parts of 28.

In 5036 pounds weight of Cotton, how many hundreds weight?

C. qrs. lb.

Anfw. 44 3 42

Example

Example 3.

C. qrs. lb. oz. dr.

In 24 3 24 12 14 how many Drums?
4 Qrs. 1 C.

99 Quarters
28 lb. 1 Quarter.

796
200

2796 Pounds.
16 Oz. 1 lb.

16778
2797

44748 Ounces
16 Drums 1 Oz.

268492
44749

In 16)715982 Drums, how many Hundreds, &c.

64

75
64

119
112

78
64

142

128 4)99 Qrs.

16)44748

32 ...

127
112

154
144

108
96

(12)

4)
(28)2796(99 qrs.
252 — 24 3

276
252

(24)

(14) C. 24 3 24 12 14 Answ. and Proof.

Example

Example 4.

In C. 24 3 26 how many Pounds?

$$\begin{array}{r}
 4 \\
 \hline
 99 \\
 28 \\
 \hline
 798 \\
 200 \\
 \hline
 \end{array}$$

Ans. 2798 Pounds.

Or thus:

$$\begin{array}{r}
 112 \text{ lb. a C. Weight.} \\
 24 \text{ the Number of C.} \\
 \hline
 448 \\
 224 \\
 \hline
 110 \text{ the odd Weight.} \\
 \hline
 \end{array}$$

lb. 2798 Answ.

Example 5.

C. grs. lb.

In 425 3 22 how many Pounds?

Mult. by 112

$$\begin{array}{r}
 5100 \\
 425 \\
 \hline
 106 \text{ Odd Wt.} \\
 \hline
 \end{array}$$

47706 Answer.

Here I say, 12 times 5 is 60,
 &c. and take in the odd
 Weight.

A Quicker Way.

Hundreds, Quarters, and Pounds, may be speedily reduced into Pounds, thus: Set down the Gross Hundreds, four several Times, in the Form following, and take in the Odd Weight, as above.

C. grs. lb.

In 24 3 26 how many Pounds?

$$\begin{array}{r}
 24 \\
 24 \\
 24 \\
 24 \\
 \hline
 \end{array}$$

110 Odd Weight.

Answ. 2798 Pounds as above.

Here

Here is nothing to do but to set the Hundreds down, as before, with the odd Weight; and add them together, and therefore it is the shortest Way of all others to reduce Hundreds Grofs into Pounds.

More Examples.

In C. 27 3 19 how many Pounds?

27	112 lb. 1 C. Weight.
27	27
27	
103 Odd Weight.	784
	224
Answer 3127 Pounds.	103 Odd Weight.
	3127 Pounds.

In one Hoghead, qt. C. $7\frac{1}{2}$ 12 how many Pounds?

7
7
7
68 Odd Weight.

Ans. 852 Pounds.

In C. 256 1 17 how many Pounds?

256
256
256
45 Odd Wt.

Ans. 28717 Pounds.

In C.

In C. 4 3 27 how many Pounds?

$$\begin{array}{r}
 4 \\
 4 \\
 4 \\
 \hline
 111 \text{ Odd Wt} \\
 \hline
 559 \text{ Answer.} \\
 \hline
 \end{array}$$

112 lb. 1 C. Wt.

$$\begin{array}{r}
 4 \\
 \hline
 448 \\
 111 \text{ Odd Weight.} \\
 \hline
 559 \text{ Proof}
 \end{array}$$

Examples at large.

In C. $9\frac{1}{2}$ 14 lb. of Indigo, how many Pounds?

$$\begin{array}{r}
 112 \\
 \hline
 1078 \text{ Answer.} \\
 \hline
 \end{array}$$

In C. $246\frac{3}{4}$ of Cotton Yarn, how many pounds?

Answer 27636.

Tuns. C. qrs. lb.

In 276 12 3 24 of Cheese, how many Pounds?

Answer 619692.

In 574859 Pounds of Copper, how many Tuns, &c.

Tuns. C. qrs. lb.

Divide by 112, &c.

Answ. 256 12 2 19

In 426 C. of Tobacco, how many Boxes, each to weigh

12 lb

Answer 3976.

In C. 417 3 12 of Pimento, how many Casks, each

C. $3\frac{1}{4}$ 26 lb

Answer 120.

Suppose

Suppose 6 Oxen weigh C. 38 2 8 how many Stone?
 Answer 308 *St*, 8 *lb*.

Silk of 24 Ounces to the Pound, is reduced to Pounds of 16 Ounces by adding the $\frac{1}{2}$, because 8, the $\frac{1}{2}$ of 16, is the Difference between 16 and 24.

Example.

Reduce 756 *lb*. of *Tripoli* Belladine Silk of 24 Ounces to the Pound, to 16 Ounces to the Pound.

$$\begin{array}{r} 756 \\ 24 \\ \hline 3024 \\ 1512 \\ \hline \end{array}$$

Short Way.

$$\begin{array}{r} 756 \\ 378 \text{ The } \frac{1}{2} \text{ added.} \\ \hline 1134 \\ \hline \end{array}$$

16)18144(1134 Answer.

If I have C. 155 3 22 of Beef for Sea Use, and to be cut into Pieces, *viz.* in $\frac{1}{2}$ Pound Pieces, Pound Pieces, Pound and $\frac{1}{2}$ Pieces, 2 Pound Pieces, 3 and 4 Pound Pieces; and of each of these Quantities an equal Number, *i. e.* as many Pieces of 4 Pounds each as of Pieces of $\frac{1}{2}$ Pounds, &c. each, what is the Number?

Ans. 1455 Pieces and $\frac{1}{2}$ or $\frac{1}{2}$ Piece of each Quant.

TROY WEIGHT.

lb. oz. dwt. gr.

In 212 10 17 22 how many Grains?
 12 Ounces 1 Pound

2554 Ounces
 20 dwt. 1 Ounce

51097 Penny Weights
 24 Grains 1 dwt.

204390
 102196

1226350 Grains, Ans.

In 1226350 Grains how many Pounds, &c.

$$\begin{array}{r}
 24) 1226350(\quad 2|0) \quad 5109|7 \\
 \underline{120} \quad \dots \quad \underline{12) 2554 \quad 17} \\
 26 \quad \underline{\hspace{1cm}} \quad \text{lb. } 212 \quad 10 \quad 17 \quad 22 \\
 24 \quad \underline{\hspace{1cm}} \quad \underline{\hspace{1cm}} \\
 235 \\
 \underline{216} \\
 190 \\
 \underline{168} \\
 (22)
 \end{array}$$

In 246 Ingots of Silver, each weighing 4 lb. $\frac{1}{2}$ Troy, how many Ounces? Answer 13284 Oz.

Out of 79640 Oz. of Silver, how many Snuff-Boxes may be made, each to weigh 3 Oz $\frac{2}{3}$? Answer 21237 Boxes, $1\frac{5}{3}$ or $\frac{1}{3}$.

What Quantity of Gold must there be to make 674 Funeral Rings, each to weigh 3 dwt. 12 Grains. Answer 117 Oz. 19 dwt.

In 47624 Bars of Spanish Silver, each 36 Oz. $\frac{1}{4}$ how many Ounces? Answer 1726370 Oz.

CLOTH

CLOTH MEASURE.

Yds. qrs. Nls.
 In 246 3 2 how many Nails?
 4 qrs. 1 Yard.

987
 4 Nails 1 Quarter

Answer 3950 Nails

In 426 Ells *Flemish*, how many Ells *Engl.*
 3 qrs. 1 Ell *Flemish*.

5 qrs. 1 Ell } 5) ———
English. } 1278 qrs.

Engl. Ells 255 $\frac{3}{5}$ Answer.

Or you may multiply by 6 Half Quarters, and divide by 10 Half Quarters, which is shorter; because in dividing by 10, you only cut off a Figure from the Dividend, and the Work is done.

In 5426 Ells *Flemish*, how many Yards?

3
 4) 16278

Answer. 4069 $\frac{2}{4}$ or $\frac{1}{2}$ a Yard.

In 376 *French* Aulmns or Ells, how many Yards?
 6 qrs. 1 Fr. Aulmn.

4) 2256

564 Yards, Answer.

In

In 564 Yards, how many Aulms?

$$\begin{array}{r} 4 \\ \hline 6)2256 \end{array}$$

376 Answer and Proof.

Ells *English* are reduced into Yards by adding $\frac{1}{4}$.

More Examples.

In 426 Ells *English*, how many Yards?
106-2 the $\frac{1}{4}$ to be added.

$$\begin{array}{r} \hline 532-2 \text{ Facit.} \\ \hline \end{array}$$

On the contrary, Yards are brought into Ells *English* by subtracting $\frac{1}{3}$.

In 532 Yards $\frac{1}{2}$ how many Ells *English*?
106 the $\frac{1}{3}$ to be subtracted.

Answer 426 Ells *English*.

Ells *Flemish* are brought into Yards by deducting $\frac{1}{4}$.

In 5960 Ells *Flemish* how many Yards?
1490 the $\frac{1}{4}$ to be subtracted.

Answer 4470 Yards.

Yards are reduced into Ells *Flemish* by adding $\frac{1}{3}$.

In 4470 Yards, how many Ells *Flemish*?
1490 the $\frac{1}{3}$ to be added.

Answer 5960

Ells

Ells *Flemish* are brought into Ells *English* as expressed before, viz. by multiplying by 6, and dividing by 10; or cutting off the last Figure or Cypher.

In 4920 Ells *Flemish*, how many Ells *English*?

$$\begin{array}{r} 6 \overline{) 10) 2952,0} \\ \hline \end{array}$$

Ans. 2952 Ells *English*.

Ells *English* are reduced into Ells *Flemish*, by adding a Cypher, and dividing by 6, or by adding $\frac{2}{3}$.

In 4726 Ells *English*, how many Ells *Flemish*?

Or thus:

$$\begin{array}{r} 6) 4726,0 \\ \hline \end{array} \quad \begin{array}{r} 4726 \\ 1575 \\ 1575 \\ \hline \end{array} \left. \begin{array}{l} \\ \\ \end{array} \right\} \begin{array}{l} \text{The } \frac{2}{3} \text{ to be} \\ \text{added.} \end{array}$$

Ans. $7876\frac{2}{3}$ or $\frac{2}{3}$ Ells *Fl*.

As before $7876\frac{2}{3}$

LIQUID MEASURE.

Tuns. Hbds. Gall.

In 65 2 24 how many Pints of Wine?
4 Hbds. 1 Tun.

262 Hogsheads.
63 Gall. 1 Hbd.

790
1574

16530 Gallons.
8 Pints 1 Gall.

132240 Pints, Ans.

In

8)

In 132240 Pints of Wine, how many Tuns, &c.

$$\begin{array}{r}
 4) \\
 63) 16530) 262 \text{ Hogheads.} \\
 126 \text{ --- bds. gall.} \\
 \text{--- Tuns } 65 \quad 2 \quad 24 \text{ Answer.}
 \end{array}$$

393

378

150

126

(24)

In 20 Tuns of Beer how many Quarts?
 4 Hogheads, 1 Tun.

80 Hogheads.

54 Gall. 1 Hoghead of Beer.

320

400

4320 Gallons.

4 Quarts 1 Gall.

17280 Quarts, Answer.

54 Gallons make a Hoghead of Beer, therefore to bring Firkins into Hogheads take $\frac{1}{6}$ Part, or divide by 6, and it quotes Hogheads, because 6 times 9, the Gallons in a Firkin, make 54.

To bring Hogheads into Barrels add $\frac{1}{2}$, because 18, the $\frac{1}{2}$ of a Barrel, and 36 the whole, make 54, the Hoghead. To bring Kilderkins into Hogheads, divide by 3, because 3 times 18 make 54. Barrels are brought into Tuns, by dividing by 7, as follows:

7)

In 420 Barrels, how many Tuns?

60 Answer.

Examples.

Examples.

Admit a ship's Cargo from the *Canaries*, to be, *viz.*
250 Pipes, 130 Hogsheads, and 150 Quarter Casks;
how many Gallons in all? And allowing every Pint to
be a Pound, what the Weight also?

Answer 444¹/₅ Gallons, and 158 Tuns 12 C¹/₂.

In 444 Firkins of Ale, how many Pints?

Answ. 28416.

In 74640 Pints of Beer, how many Barrels?

Answ. 259⁶/₃₈.

In 45 Fats, or Vates of Rhenish Wine, each of 242
Gallons, how many Aumn Casks, each 42 Gallons?

Answ. 259¹/₄.

Note, *Rhenish Wine is sold by the Aumn, of about 42 Gal.*

In 57 Pipes and 42 Gallons of *Madeira Wine*, how
many Puncheons, Hogsheads, and Tierces?

Answer 86 Pun. 114 Hhds. 42 Gal. 172 Tier.

In 40 Tuns, and 50 Butts, and 60 Pipes of *Wine*,
How many Tierces do they make, admit they came from
Rhine?

Answ. 570.

D R Y M E A S U R E.

Lasts 2rs. Bush. Gall.

In 24 7 6 2 how many Gallons of Wheat?

10 Quarters 1 Last.

247 Quarters.

8 Bush. 1 Quarter.

1982 Bushels.

8 Gallons 1 Bushel.

15858 Gallons.

In

In 40 Lasts of Barley, how many Combes?

Answer 800

In 3228 Fats or Vates of Sea-Coal, how many Chaldrons and Scores?

Answer { 807 Chaldrons.
38²/₁₁ Scores.

In 33 Weyes of Salt, how many Quarters, Bushels, and Pecks?

Answer { 165 Quarters.
1320 Bushels.
5280 Pecks.

In 20 Lasts and 30 Weyes of Corn, that's called Rye, How many Bushels do they make, if you by Bushel buy?

Answer. 2800 Bushels.

In 38880 Pecks of Sea-Coal, how many Chaldrons?

Answer 270

LONG MEASURE.

In 50 Miles how many Barley-Corns in Length?

8 Furlongs 1 Mile

400 Furlongs
220 Yards 1 Furlong

8000
800

88000 Yards
3 Foot a Yard

264000 Feet
12 Inches 1 Foot

3168000 Inches
3 Barley-Corns 1 Inch

9504000 Barley-Corns in 50 Miles

In 17490 Square Poles, how many Acres, &c.
 16|0)1749|0(109 Acres.

16

149

144

4|0) 5|0(1 Rood.

Acr.

Rood.

Poles.

(10) Answer 109

1

10

Here is a small Name to be brought into a great, and therefore it is performed by Division; wherefore I divide the square Poles by 160, the square Poles in an Acre, and the Quotient is Acres, and the Remainder is Poles, which I divide by 40, the square Poles in a Rood, and there comes but one Rood, or $\frac{1}{4}$ of an Acre, and 10 Poles remain. So the whole is 109 Acres, 1 Rood, and 10 Poles, as by the Work above.

T I M E.

I desire to know how many Days, Hours and Minutes, there are since the Birth of our Saviour to the Year

1754?

365 Days in a Year.

1754

8770

6 Hours want-

10524

ing.

5262

10524 Hours

added

640210 Days

24 Hours in a Day

2560840

1280420

15365040

10524 Hours added

15375564 Hours

60 Minutes in an Hour.

922533840 Minutes

H

Here

Here, in regard that there are 6 Hours lost every Year, (for the Year consists of 365 Days, 6 Hours) I multiply the Year by 6, which produces 10524 Hours to be added to the Product of Hours.

Or it may be done thus: Bring a Year into Hours, in which you will find 8766, by which multiply that Number of Years; and that *Product* by 60, and the last *Product* will be the Answer; as by the following Work.

<i>Days.</i>	<i>Hours.</i>	
365	6 a Year	1754 Years
24 Hours 1 Day		8766 Hours in a Year
1466		10524
730		10524
8766		12278
		14032
		15375564 Hours since
		60
		922533840 Minutes since

From the 6th of June, 1682 to the 15th of August, exclusive, 1721; how many Days; adding 9 Days for the Leap Years; being 1 Day every 4th Year?

Answer 14313.

From the 19th of August, 1701, to the 21st of January, exclusive, 1717; (noting the Leap years) how many Days? Answer 5998.

Here follow some Questions, promiscuously set for the Exercise of the Learner's Ability.

In 305 *l.* 12 *s.* 7 *d.* how many Half-pence? Answer 146702.

In 3192 *lb.* Weight, how many Hundred Weight? Answer 28 *C.* $\frac{1}{2}$.

In 3 *C.* $\frac{3}{4}$ of Tobacco, how many 12 *lb.* Boxes? Answer 35.

In

In 270 lb. 11 oz. 12 dwt. how many Penny Weights?
 Answer 65032.

In 730 Rix-Dollars, at 4 s. 5 d. $\frac{3}{4}$, how many Ducats, at 4 s. 4 d? *Answer* 754 $\frac{1}{2}$ $\frac{18}{108}$, or 2 s. 5 d. $\frac{1}{2}$ over.

In 3 lb. 10 oz. of Gold, how many Mourning Rings, each 2 dwt 12 Grains? Answer 368.

In 1260 Quarts, how many Hogheads of Wine?
Answer 5 Hogheads.

In 60 Kintals of *Pruans*, how many C. Weight,
(a Kintal being 100 lb.) *Answer* 53 C. 2 qrs. 8 lb.

In 506 *l.* 12 *s.* 2 *d.* how many Portugal Reas at 20 for 3 *d*? Answer 810573 $\frac{1}{3}$.

In 56 Boxes of Sugar, each 2 C. $\frac{3}{4}$, how many C. Weight? *Answer* 154.

In 4679 Yards, how many Ells *English*? *Answer*
3743 $\frac{1}{2}$.

In 86 *l.* how many Guineas, at 21 *s.* 6 *d.*? *Answer*
80 Guineas.

In 88000 Yards how many Miles? *Answer* 50.

In 14760 Ells *Flemish*, how many Yards? *Answer*
11070 Yards.

In 75 C. 3 qrs. 20 lb. how many Pounds? *Answer*
8504 lb.

In 176 C. 2 qrs. 24 lb. of Sugar at Jamaica, (the C. Weight being 100 lb.) how many C. Weight at London, the C. Weight being 112? *Ans.* 157 C. 3 qrs. 6 lb.

In 6000 *French Crowns* at 57 *d.* each, how many Pounds Sterling? *Answer* 1425.

In 34 lb. 6 oz. *Troy*, how many Ounces? *Answer*
414 Ounces.

*In Guineas 90, and in Pistoles nine,
How many Pence, and what in Sterling Coin.*

The Guineas at 21 s. } Answer 24516 Pence, or
and Pistoles at 17 s. } 102 l. 3 s.

In 46 Packs of Cloth, each Pack 24 Pieces, and each Piece 43 Ells *Flemish*, how many Ells *English* and Yards?
Answer 28483 $\frac{1}{2}$ Ells *English* and 35604 Yards.

If I had Nobles Eighty Score, and Marks just Fifty-two,
In part of Fourteen Hundred Pounds; What Money rests
still due?

Answer 832 l.

How many times doth a regular Clock strike in a Year?

Answer 56940.

In 15400 Vares of Valencia, 100 of which make 85
Yards English, how many Yards and Ells English?

Answer 13090 Yds. and 10472 Ells English.



C H A P. VII.

Of T A R E and T R E T, &c.

Gross Weight is the Weight of a Commodity, with the Weight of the Hogshead, Chest, Cask, Box, Wrapper, or any Thing else that contains the Goods: Or any Quantity given in Hundreds, Quarters and Pounds, is Gross Weight.

T A R E is an Allowance made by the Seller to the Buyer, for the Weight of the Hogshead, Cask, Chest, Box, Bag, &c. wherein the Goods are contained. And is sometimes reckoned at so much *per* Bale, Bag, Barrel, Chest, &c. As in Silks, Cottons, Raisins, Capers; at other times at so much *per* C. as 10, 14, 16, or 24 lb. *per* C. There is also a Distinction of Custom-House and Invoice Tare, as in Tobaccos, and Indigoes, &c. and sometimes uncertain, as in Tobaccos and Sugars, happening according to the Size of the Casks.

T R E T is an Allowance of 4 lb. upon every 104 lb. Suttle, claimed by Free-Men of London, (and sometimes to others also) and this is allowed for Waste and Dust on some Sorts of Goods; as on Tobaccos, Spices, Drugs, &c.

C L O F F

CLOFF is an Allowance of 2 lb. upon every Draught above 3 C. Weight to Citizens of London.

Neat Weight is what Remains when the Allowances are deducted.

Example.

In 20 Bags of Hops, containing *Gross* 88 C. 1 qr. 19 lb. *Tare* 4 lb. per C. how many C. neat.

	C.	qrs.	lb.		C.	qrs.	lb.
<i>Gross</i>	88	1	19		88	1	19
<i>Tare</i>	3	0	17		4 lb. per C.		
<i>Neat</i>	85	1	02	112)	353	<i>Tare</i> (3 C.	
					336		
					(17)		

I multiply the given Hundreds by 4, the *Tare* allowed for each Hundred, which produces, with 1 lb. allowed for the Quarter, 353 lb. *Tare*, which I divide by 112 and the Quotient gives 3 C. Weight, and 17 lb. remains, which I subtract from the *Gross* Weight, and the Remainder is C. 85 1 02 for the neat Weight. See the Work.

When the *Tare* is at so much per C. Weight, multiply the *Gross* Weight by the *Tare*, and divide the Product by 112, and the Quotient will be the *Tare*. Or subtract the *Tare* per C. from 112, and by the Remainder multiply the *Gross* Weight, and the Product divide by 112, and the Quotient will be the neat Weight. Or if you multiply the Pounds *Gross* by the Pounds *Tare*, and divide by 112, the Quotient gives the Pounds *Tare*.

In 7 Bags of Cotton, each 2 C. $\frac{1}{2}$, *Tare* 7 lb. per Bag, how many Pounds neat?

$2 \frac{1}{2}$ C. each
7
 $17 \frac{1}{2}$
17
 17
17,56 the $\frac{1}{2}$ C.

7 Bags
 7 lb. Tare each
—
 49 lb. Tare

From 1960 lb. Gross
 Sub. 49 lb. Tare
—

Answ. 1911 lb. Neat.

In 27 Bags of Pepper, containing
 4 lb. Bag. } C. qrs. lb.
— Tare } Gross 58 3 11 Tare 4 lb. per Bag.
 108 lb. Tare } 58
— 58
 58,95 for 3 qrs. 11 lb.

[How many Pounds 6591 Pounds Gross
 Neat?] 108 Tare

Answ. 6483 Pounds Neat.

Three Hogsheads of Tobacco, Wt. viz.
 N^o 1 C. 5 1 17 Tare 90 lb.
 2 C. 6 2 10 — 87
 3 C. 5 3 20 — 85

17 3 19 — 262

17

17 [How many Pounds Neat?] 17

17

103 Odd Weight

2007 Gross Pounds
 262 Pounds Tare
—

Answ. 1745 Pounds Neat.

Four Barrels of Indigo, qt. viz.

		C.	qrs.	lb.	lb.
No	1	4	1	10	Tare 36
	2	3	3	20	— 29
	3	4	0	19	— 32
	4	4	0	30	— 35

How many Pounds neat?

16 2 23 — 132

Answer lb. 1739

Six Hogsheads of Tobacco, Wt. viz.

	C.	qrs.	lb.	lb.
Tret. 4 lb. per 104 lb.	4	3	21	Tare 76
and Cloff 12 lb. How many	5	2	17	— 96
Pounds neat?	6	1	20	— 100
	4	3	24	— 84
	7	1	13	— 102
	5	2	26	— 98

The Tret is always found out, by dividing the Suttle Pounds by 26; because 4 times 26 is 104.

lb.

26)3373(129 $\frac{1}{2}$

26

77

52

253

234

(19)

The Half Pound in the Tret is allowed for the 19 Pounds remaining.

H 4

In

Gross 35 0 09 — 556

35

35

3509

3929 Pounds Gross

556 Pounds Tare

3373 Pounds Suttle

129 $\frac{1}{2}$ Pounds Tret3243 $\frac{1}{2}$ Rest

12 Cloff

Answ. 3231 $\frac{1}{2}$ lb. Neat Wt.

In 5 Barrels of *Nutmegs*, Wt. 18 C. $\frac{1}{2}$, and 07 lb. *Gross*, *Tare* 30 Pound *per* Barrel; and *Tret* 4 Pound *per* 104 lb. how many Pounds neat?

	C.	qrs.	lb.	
30 lb. Tare	18	2	07	Gross
5 Barrels	18			
	18			
150 Tare	18	63		
2079 Pounds Gross				
150 Tare.	26	1929	74 lb. Tret	
		182		
1929 Rest				
74 Tret			109	
			104	
1855 Answ.			(5)	

When the *Tare* is at so many Pounds *per Cent.* or 112 lb. if it happen to be any even Part of a Hundred Weight, it may be sooner done by dividing the *Gross Weight* by that Part, according to the Rule of *Division* of several Denominations: As admit it to be at 14 lb. *Tare per Cent.* then take the 8th Part of the *Gross Weight*, or divide it by 8, because 14 lb. is the 8th Part of a Hundred Weight, and the Quotient will be the *Tare* in *Gross Weight*, which subtract from the first *Gross Weight*, and the Remainder will be the *Neat Weight*.

Example.

	C.	qrs.	lb.	
20 Bags, qt. (8) 48	1	24	Gross, Tare, 14 lb. per C.	
14 Pound per C.				
	6	0	06 $\frac{1}{2}$ Tare	
Facit C. 42	1	17 $\frac{1}{2}$	Neat Weight	

Here I say, the Eights in 48, 6 times; then the Eights in 1, 0 times, but turning it into Pounds, that is 28, and
24 in

24 in the Place of Pounds make 52; then the Eights in 52, 6 times, and there rests 4, which I multiply by 4, the Quarters in a Pound, and they make 16; then the Eights in 16, twice or $\frac{1}{2}$ a Pound. So the Tare is 6 C. 00 qrs. 06 lb. $\frac{1}{2}$, which I subtract from 48 C. 1 qrs. 24 lb. and the Remainder is 42 C. 1 qr. 17 lb. $\frac{1}{2}$, for the Neat Weight; as by the Work above.

If the Tare be 16 lb. per Cent. then divide the Gross Weight, by 7, because 16 lb. is the 7th Part of a Hundred Weight.

Example

12 Hhds. } C. qrs. lb
 qt. (7 } 59 3 14 at 16 lb. per Cent.

Tare 8 2 06 the 7th Part

Neat Wt. 51 1 08

If the Tare be 18 lb. per Cent. then for the 16 Pounds work as in the last Example; and for the 2 Pounds take the 8th Part of the Quotient, and add them together for the whole Tare.

If the Tare be 20 lb. per Cent. then for 16 Pounds, work as before; and for the 4 Pounds take the 4th Part of that Quotient, and add them together for the whole Tare. If the Tare be 8, 10, or 12 lb. per Cent. or any lesser Number; then take the Half of the Gross Weight, which will make it Half Hundreds; then 8 lb. is the 7th Part of $\frac{1}{2}$ C. 10 lb. is divided into the 7th Part, and 4th of that 7th Part; 12 lb. into the 7th Part, and half of that 7th Part, &c.

Oil is entered at the Custom-House by the Gallon and pays Duty accordingly; yet in uncertain Casks it is weighed, and the Tare allowed is 18 lb Per C. which being deducted, is computed at 7 lb. $\frac{1}{2}$ per Gallon; and

H <

reduced

reduced thus: Multiply by 94, (that being the Neat Weight of 112) and the Product is the Neat Pounds, which doubled brings them into Half Pounds, which divide by 15, the half Pounds in 7 Gallons and $\frac{1}{2}$, the Quotient gives the Contents in Gallons, which, if divided by 252, gives Tuns, &c.

Example.

	C.	qrs.	lb.	
Reduce	124	3	16	into Gallons.
	94			
	496			
	1116			
	100			
	11756			Pounds.
	2			

Half Pounds 15)23512(1567 $\frac{2}{3}$ Gallons.

(7)

Oil in certain Casks, 1 in 20 is allowed for Leakidge, but under 10 none.

In *Candy* Barrels the *Tare* is 29 lb. *per* Barrel; and from *New England*, 50 lb. *per* Barrel.

Admit

Admit 50 Barrels of Oil from *New-England*, to contain

122 C. 3 qrs. 12 lb.

122

122

122,96

13760 Pounds

2500 Tare

11260 Neat

11260

15)22520(Half Pounds

Answ. 1501 $\frac{1}{3}$ Gallons

Or Pounds of Oil are reduced into Gallons by multiplying the Neat Pounds by 2, and dividing that Product by 3; and that Quotient again by 5, gives the Neat Gallons of 7 lb. $\frac{1}{2}$ per Gallon,

T A R E S.

			<i>Allom</i> , in Casks, 12 lb p. C.	
Tare	{ 8 }	to { 12 }	1 Pot-Asbes.	10 ditto
of Sugars	{ 12 }	{ 15 }	1 $\frac{1}{4}$ Argil, or Argol	14 ditto
from	{ 15 }	{ 17 }	1 $\frac{1}{2}$ in Casks,	
			<i>Almonds</i> in Bags	14 ditto
Oil 18 lb. per C.			<i>Raisins</i> in	14 lb. per Frail.
Madder in Bales, 28 lb.			Frails or	
Tare per Bale.			Baskets.	
Ditto in Fats, or Vates,				
10 lb. per C.				

Many more Examples might be offer'd, but those foregoing I think are sufficient for the Service and Improvement of any ingenious Person.



C H A P. VIII.

The GOLDEN RULE:

Or Rule of Three Direct.

THIS is called the *Rule of Three*, from its having Three Numbers to work with to find a Fourth in Proportion to them; which fourth Number is the Answer to the Question.

It is also called the *Golden Rule*, from its excellent Use and Performances in *Arithmetick*.

And sometimes the *Rule of Proportion*, because the fourth Number bears the same Rate or Reason to the Third, as the Second to the First.

I. Observe, that of the three given Numbers in any Question of this *Rule*, you have two of them always of one Name, or Kind; that is, if one be *Money*, so is the other; or if one be *Weight*, the other is so also; And one of which Numbers must be the first Number in Stating, and the other the Third; and that must always be the Third which moves the Question, and the other of the same Kind, must be the First Number; and the other Number, which is of another Denomination, always possesses the middle Place, and is evermore of the same Kind with the Answer, or fourth Number sought. As for *Example*.

If 12 Ells of *Holland* cost 36 *s.* what will 456 Ells cost at that Rate?

Here in stating the Question for the Work 456 must be the third Number, because that is the Number that asketh the Question: for 'tis required to know what will

456 Ells cost? And the other Number of the same Name, is to be the first, which is here 12; and the last Number, which is of the same Kind with the Number sought, or Answer to the Question, possesses the middle Place, and when stated for the working stands thus:

<i>Ells</i>	<i>s.</i>	<i>Ells</i>
If 12 cost		36 what 456?

II. Whenever it happens, that either one, or both of the extreme Numbers, be of divers Denominations, they must be reduced into the lowest Name mentioned; that is, if they be *Pounds*, *Shillings*, and *Pence*; or *C. qrs.* and *lb.* then they must be reduced into *Pence*, or *Pounds Weight*. And if one of the Extremes be of several Denominations, and not the other, yet must both be reduced into one Name; that is, if one consists of *Pounds*, *Shillings* and *Pence*, and the other only of *Pounds*, yet that Number which is only *Pounds*, must be brought into *Pence* as well as the other, that the first and third Numbers may be of the like Name, which always must be; that is, if the first Number be *Feet*, the third Number must be *Feet* likewise; and if one be *Gallons*, the other must be *Gallons* also, &c. as was said before. If the middle Number be of divers Denominations, it must be reduced into the lowest Name mentioned therein (or lower if there's Occasion) as well as the first or third Numbers.

III. When the Numbers are disposed in such Order, as before directed, and stated accordingly, then multiply the second and third Numbers together; that is, the third by the second, or the second by the third, (it being all one) and divide that Product by the first Number, and the Quotient of that Division will be the Answer, and in the same Name with the middle Number; that is, if the middle Number be *Shillings*, so will the Quotient also. Or if the middle Number be *Pence* or *Farthings*, so likewise will be the Quotient, or Answer.

For

For the better understanding the foregoing Notes and Directions, I shall comprise them under these short Heads following, &c.

1. That must be the third Number, which asketh the Question.

2. First and third Numbers must be of one Name, or so reduced.

3. The middle Number, if of divers Denominations, must be brought into the lowest mentioned; or lower, if Occasion require it.

4. Multiply the second and third Numbers together, and divide that Product by the first Number, and the Quotient thence arising, will be the Answer to the Question, in the same Name you left your middle Number in.

The fourth Number, or Answer to the Question, if in a direct Proportion, may be found these three several Ways, *viz.*

(1.) By multiplying the second and third Numbers together, and dividing the Product by the first, and the Quotient will be the Answer: As in the 4th Direction above.

2. By dividing the second Number by the first, and then multiplying that Quotient by the third, and that Product will be the Number sought.

(3.) By dividing the third by the first, and then multiplying that Quotient into the second Number, and that Product will be the Answer.

Tho' all these Ways be equally true, and the two last very concise when either the second or third Terms may be divided by the first, yet the first is most in Use.

N. B. *When the first Term is an Unit, the Answer is found by Multiplication only. When the second or third Term is an Unit, then the Answer will be found by Division only.*

Example 1.

Example 1.

If 12 Ells of *Holland* cost 36 Shillings, what will 456 Ells cost at that Rate?

The Numbers being ranked according to the Directions given in the first Rule of this Chapter, they stand thus:

Ells	s.	Ells
If 12 cost	36, what	456?
		36 Second Number.

$$\begin{array}{r} 2736 \\ 1368 \\ \hline \end{array}$$

The first Number, 12)16416

$$\begin{array}{r} 2|0 \quad 136|8 \\ \hline \end{array}$$

Anfw. l. 68 o8.

Here (according to Rule) I multiply the third Number 456 by 36, the second Number, and the Product is 16416, which I divide by 12, the first Number, and the Quotient is 1368, which are so many Shillings; because the middle Number was left in Shillings: Then those Shillings in the Quotient I bring into Pounds, according to the Rule given in *Reduction*, page 129, by cutting off the Figure towards the Right Hand, and halving those towards the Left, and the Answer is 68 l. 8 s. as may be seen in the Work above.

Example 2.

If 456 Ells of *Holland* cost 68 l. 8 s. what will 12 Ells cost at that Rate? Stated thus as follows.

Ells

Ells l. s. Ells
If 456 cost 68 8, what 12?

20

1368

12 Third Number

First Number, 456) 16416(36s. Answer

1368

2736

2736

(c)

Here the Question lies upon 12 Ells, for it is asked, *What will 12 Ells cost?* Therefore, in the stating, it is the Third Number, (as it is also in the Question, but sometimes it does not so happen, that the Numbers in a Question lie in such Order as they ought to do in stating) and the other of the same Name is the first, *viz.* 456; and the middle Number is of the same Name you seek for, *viz.* Money, for we want to know how much Money 12 Ells will cost? but here the middle Number is of more Denominations than one, *viz.* of *Pounds* and *Shillings*; and therefore it is brought into the lowest Name mentioned, to wit, *Shillings*. Then I multiply the second and third Numbers together, and divide their Product by the first, and the Quotient is the Answer, *viz.* 36s. and is a Proof to the first *Example*. And so may any Question be proved by stating it reverse-ly, or otherwise varying the Question several Ways.

IV. If after you have divided the Product of the second and third Numbers multiplied together by the first Number, any thing remains, the Value of that Remainder may be found, by multiplying the said Remainder by the Parts of the next inferior Denomination, that are equal to one of the Quotient: That is, suppose the Quo-

Quotient is Shillings, and there is a Remainder, that Remainder must be multiplied by 12, because 12 of them, viz. Pence, (the next lower Denomination,) make one of the Quotient, to wit, a Shilling, and divide that Product by your former Divisor, the first Number, and the Quotient will be the Value of that Remainder, in the Parts aforesaid. And if any thing yet remain, it must be multiplied by the Parts of the next inferior Denomination, that are equal to a Unit of the last Quotient, and still divide by the same Divisor, &c. And so must you proceed till nothing remains, or till you have brought it as low as you desire.

Example 3.

If one Hundred Weight of Currants cost 2 l. 9 s. 6 d. what will 45 C. 3 qrs. 14 lb. cost at that Rate? Stated as follows.

If

lb. l. s. d. C. qrs. lb.
If 112 cost 2 9 6 what 45 3 14?

20	4
49	183
12	28

594 2d Numb. 1468

367

5138 Third Number.
594 Second Number.

20552
46242
25690

The first Number 112) 3051972 (12)
224 27249 Pence

224
811
784 Ans. l. 113-10-9d. $\frac{3}{4}$

279
224

557
448

1092
1008

84 Remainder
4

112) 336 ($\frac{3}{4}$
336

(0)

Here

Here the third Number is brought into the lowest name mentioned, *viz.* Pounds; therefore the first Number, 1 hundred Weight must be in Pounds also. Likewise the middle Number is brought into the lowest Name mentioned in that. Then the second and third Numbers are multiplied together, and that Product divided by the first; and the Quotient is Pence, because the middle Number was reduced into pence; then the Pence in the Quotient are brought into Pounds by *Reduction*; and they make 113 *l.* 10 *s.* 9 *d.* But there is a Remainder of 84; wherefore I conclude that makes something more; therefore I multiply that Remainder by 4, the Parts of the next inferior Denomination, and divide that Product by the former Divisor, *viz.* 112, and it quotes 3, which is three Farthings, and nothing remains. So that the whole is 113 *l.* 10 *s.* 9 *d.* $\frac{3}{4}$. See the Work.

Example

Example 4.

If 15 Weeks Pay comes to 2*l.* 12*s.* 6*d.* what is that a Year? Stated thus:

<i>Weeks</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>Weeks</i>
If 15 give	2	12	6,	what 52?
	20			
	52			
	12			
	630	2d Number		
	52	3d Number		
	1260			
	3150			
			12)	
1st Number 15)	32760	(	2184	Pence
	30			
			2 0)18 2	
	27			
	15			l. 9-2 Answer
	126			
	120			
	60			
	60			
	(0)			

Example

Example. 5.

If one Ounce of Silver be valued at 5 s. 2 d. what is the Value of 240 Ounces 15 dwt.

If 1 oz. cost 5 s. 2 d. what 240 oz. 15 dwt.

20	12	20
—	—	—
20 dwt. 62		4815 Penny Weights
		62 2d Number

9630
28890

1st Number, 2|0)29853|0

10 Rem. 12)14926 $\frac{1}{2}$ 0

4 Farth.

2|0)124|3-10 d.

2|0)4|0

Answ. l. 62-3-10 $\frac{1}{2}$

2 grs.

Example 6.

If a Tun of Wine cost 56 l. 14 s. what costs a Quart?

Hbds. l. s. — qt.

If 4 — 56 14 — 1

63 20

1008)13608(13 $\frac{1}{2}$ Ans.

1008

252 1134

4 12

3528

3024

1008 qts. 13608 Pence

504

4

1008)2016($\frac{1}{2}$

2016

(0)

Here

Here the middle Number is reduced lower than is mentioned, that being but Shillings, but I have brought it into Pence, because I would have the Answer the sooner, by not having so many Remainders to reduce lower. Here also the second and third Numbers are not multiplied together, because 1 would only produce the same Figures again; wherefore I only divide the second Number by the first and the Quotient is the Answer in Pence, agreeable with the middle Number, and the Remainder 504, I multiply by 4, and divide again by 1008, according to the Rule, and the Quotient produces two Farthings more, to be joined to the 13*d*. So the Answer is 13*d* $\frac{1}{2}$ the *Quart*, as by the Work may be seen.

Example 7.

Suppose my Salary be 73 Pounds a Year, what is that a Day?

Days *l.* Days?
If 365 give 73 what 1?

$$\begin{array}{r} 365 \overline{) 1460} \text{ (4 s. per Day, Answer.} \\ \underline{1460} \\ (0) \end{array}$$

Here the Year is brought into Days, that the first Number may agree with the third; and here also, I do not multiply by 1, for the Reasons abovesaid; (for a Unit of itself neither multiplies nor divides) and I cannot divide 73 by 365; wherefore I bring the Pounds into a lower Denomination, *viz.* Shillings, or lower, if there be Occasion. Then I divide according to Rule, and the Quotient gives 4*s.* the Day for Answer, agreeable to the second assertion of *N. B.* in Page 160.

Example.

Example 8.

Nutmegs at 4 *d.* $\frac{1}{2}$ per Ounce, what is that the C. Wt.

oz. *d.* *lb.*
If 1 cost 4 $\frac{1}{2}$, what 112?

4	16
18	672
	112

1792 Ounces.
18 Second Number.

14336
1792

4)32256(Farthings.

12)8064

2 0)67 2

l. 33-12 Answer.

Here the middle Number is reduced into the lowest Name mentioned, *viz.* Farthings, by which I multiply the third, and the Product is Farthings; and according to Rule, I should divide by the first Number, but the first Number being 1, it neither multiplies nor divides, (as was said before) and therefore the Quotient, or 4th Number is the same with the Product of the second and third, which is Farthings, because the second Number was Farthings, which are reduced into Pounds, as above.

I shall now shew, that many times Questions in this Rule may be contracted, and much sooner wrought by another Method of working; that is only by following the brief Methods of *Multiplication* and *Division*, sufficiently shewn in the 4th and 5th Chapters of this Book.

Example

Example 9.

If 5 Gallons of Brandy cost 1 *l.* 6 *s.* 8 *d.* what will 63 Gallons or a Hoghead cost at that Rate?

The common Way.

G.	l.	s.	d.	G.
If 5	—1	6	8—	63

20

26

12

320 2d Num.

63 3d Num.

960

1920

5)20160

12)4032 Pence

2|0)33|6

l. 16-16 Answer.

The shorter Way.

G.	l.	s.	d.	G.
If 5	—1	6	8—	63

9

12 0 0

7

1st Num. 5)84 0 0

Ans. l. 16 16 0

In working by the shorter way, I do not reduce the middle Number at all, but multiply according to the 14th Rule of the 4th Chapter of this Book, by 7 and 9, they multiplied together making the Quantity 63, which Product I divide by 5, the first Number, according to the 10th Rule of the 5th Chapter, and the Quotient is the Answer, *vi.* 16 *l.* 16 *s.* as in the common Way. Here in this short Method, the Rule of Stating and Working is followed as in the Common way; for the second and third Numbers are multiplied together, and their Product divided by the first, but there is above 20 Figures difference between one way and the other.

Example.

Example 10.

If the Wages of 3 Weeks come to 2 *l.* 3 *s.* 6 *d.* what is a Year's Wages at that Rate?

Common Way.

W. l. s. d. W.
If 3 — 2 03 6 — 52
20

43
12

522 Second l. 2 3 6 }
52 3d M. by (2) }

1044
2610

3)27144

12)9048 Pence

2|0)75|4

l. 37-14 Anf.

Shorter Way.

W. l. s. d. W.
If 3 — 2 03 6 — 52
10

21 15 0
5

108 15 0 50
4 07 0 2

1st N. 3) 113 02 0 52

Anf. l. 37 14

After I have multiplied by 10, and by 5, which make Fifty, I multiply 2 *l.* 3 *s.* 6 *d.* the middle Number, by 2, which is wanting, and add them together.

How many Yards were in that Piece of Cloth that cost l. 14 2 6 the Yard being valued at 7 *s.* 6 *d.*

Answer 39 Yards.

I

Example.

Example 11.

If 56 lb. of Coffee cost 21 l. 11 s. 8 d. what will
3 lb. cost at that Rate?

Common Way.

lb. l. s. d.
If 56 — 21 11 8 — what 3 lb.
20

431
12
5180 Second
3 Third
12)

56)15540(
112
277
2|0) 2|3(1 ½

434
392 l. 1-03-1 ½ Answer

420

392

28 Remainder

4

56)112(2

112

(0)

Shorter Method.

If 56 — 21 11 8 — 3
3

7)64 15 0

8)9 05 0

Ans. l. 1 03 1 ½

Here I divide by the first Number at twice, according
to the 11th Rule of the Vth Chapter. Here is above
30 Figures difference.

Example

Example 12.

If the Freight of a Ship be 529*l.* 11*s.* what must be given to A. B. for his $\frac{5}{32}$ Parts?

Pts. *l.* *s.* *Pts.*
If 32—give 529 11—what 5?

20
—
10591
5
—
32)52955(2|0 165|4
32
— Anfw. *l.* 82 14 10 $\frac{4}{32}$, or $\frac{1}{2}$ of a Farth.

209
192
—
175
160
—
155
128
—
Rem. 27
12
—

Short Way.
Pts. *l.* *s.* *Pts.*
32—529 11—5
5
—
4)2647 15
8) 661 18 09

Anfw. *l.* 82 14 10 $\frac{1}{2}$ Farthing.

32)324(10
32
—
Rem. 4
—
32

Here is almost 40 Figures difference.

For 3 Weeks Board I pay 11*s.* 3*d.* what is that a Year?
Answer 9*l.* 15*s.*

Example 13.

If 72 C. of Starch cost 63 l. what will 15 C. at that Rate?

C. l. C.
If 72 ——— 63 ——— 15? Answer l. 13 : 2 : 6

Short Way.

C. l. C.
If 72 ——— 63 ——— 15

3

189

5

8)945

9)118 $\frac{1}{8}$ of a l.

l. 13 : 2 : 6

Note, If at any time we know but what Part the second Number is of the first; the same Part also will the 4th Number (or Answer) be of the third. As for Example.

If 10 s. gain 2 s. what 100 l. Answer 20 l.
Which is the 5th Part of 100, as 2 is of 10.

Another short Way.

There is another Way of contracting Questions in this Rule, viz. by dividing the third Number by the first; and by that Quotient to multiply the second, which Product, or Products, will be the Answer; as in the following Example.

Example

Example 14.

If 8 Yards of Cloth cost 4*l.* 10*s.* 8*d.* what will 24 Yards at that Rate?

Common Way.

Yds. *l.* *s.* *d.* *Yds.*
If 8 — 4 10 8 — 24?

20

90

12

1088

24

4352

2176

8)26112

12) 3264

2|0) 27|2

Ans. l. 13-12

Second short Way.

Yds. *l.* *s.* *d.* *Yds.*

If 8 — 4 10 8 — 24(32

3

Ans. l. 13 12 0

Here I divide 24, the third Number, by 8, the first Number, and it quotes 3; by which I multiply 4*l.* 10*s.* 8*d.* the middle number, and the Product is the Answer; viz. 13*l.* 12*s.* 0*d.* as before. But if the Question had been stated contrariwise, viz. If 24 *Yds.* cost 13*l.* 12*s.* what 8 *Yds.*? Then you might have done it by the other short Way, as follows.

I 3

If

Yds. *l.* *s.* *Yds.*
If 24 cost 13 12, what 8?

$$\begin{array}{r} 8 \overline{) 108} \quad 16 \\ 64 \\ \hline 44 \end{array}$$

$$\begin{array}{r} 3 \overline{) 13} \quad 12 \\ 6 \\ \hline 7 \end{array}$$

Ans. *l.* 4 10 8

Or thus:

$$\begin{array}{r} \textit{l.} \quad \textit{s.} \\ 3 \overline{) 108} \quad 16 \end{array}$$

$$\begin{array}{r} 8 \overline{) 36} \quad 05 \frac{1}{3} \end{array}$$

As before *l.* 4 10 8

Or divide the first Number (when that is greatest) by the 3d, and by that Quotient divide the 2d, and that last Quotient is the Answer, as under.

Yds. *l.* *s.* *Yds.*
If 24 cost 13 12, what 8?
— 3) —
3 4 10 8 Ans.

When any thing remains (in the second short Method) after you have divided the third Number by the first, then the first and third Numbers are not proportional; for if they be, there will remain nothing. In this Case, I say, when any thing remains, you mult, after you have multiplied the middle Number by the Quotient, or whole Number; then multiply also the middle Number by the Numerator of the Fraction in its lowest Terms, and divide that Product by the Denominator, and add that Quotient to the former Product of the second Number multiplied by the Quotient, or whole Number aforesaid. An Example or two, will make it easy to be understood.

But before I proceed, 'twill be necessary a little to explain the Meaning of the Numerator and Denominator of a Fraction, and how to reduce it into its lowest Terms.

A Fraction or Part of a whole Number, arises from Division; and what remains after the Division is ended, is the Numerator, and the Divisor is the Denominator. As suppose your Divisor is 12, and your Remainder 4, then 4 is the Numerator, and 12 the Denominator; and if set Fraction-wise, stand as follows.

Re-

Remainder 4 Numerator

Divisor 12 Denominator

And to reduce this (or any other Fraction) into its lowest Terms, halve the Numerator, and also the Denominator; or divide them by 3, 4, 5, &c. or by any of the 9 Digits, that nothing remain in either; for that Figure which divides one without a Remainder, may not do so by another, but you must divide both Numerator and Denominator by such a Number as leaves no Remainder in either. But if you cannot do so, then is the Fraction in its lowest Terms already.

Example.

Reduce the aforementioned Fraction $\frac{4}{12}$ into its lowest Terms.

$$\frac{1}{2} \left\{ \frac{4}{12} \right\} \frac{2}{6} \left\{ \frac{1}{3} \right\} \text{Lowest Terms}$$

$$\frac{1}{4} \left\{ \frac{4}{12} \right\} \frac{1}{3} \text{Lowest Terms}$$

Here I reduce it by dividing it by 2, or halving it, saying the half of 4 is 2, and the half of 12 is 6: Then again, the half of 2 is 1, and the half of 6 is 3: which is as far as I can go, and the Fraction is reduced into its lowest Terms, viz. $\frac{1}{3}$. But if I divide it by 4, it reduces it sooner; for I say the 4's in 4 once, and the 4's in 12 3 times: And so it is reduced at once into $\frac{1}{3}$, as per Work. And this $\frac{1}{3}$ is equal in Value with $\frac{4}{12}$, for as 1 is the 3d Part of 3, so is 4 of 12.

I 4

Example

Example 15.

If in 15 Weeks I spend *l.* 5-5, what is that a Year?

Common Way.

W. l. s. W.
If 15-5 5-52
20

105

52

210

525

15)5460(210

45

96

90

60

60

(0)

Short Way.

W. l. s. W.

If 15-5 5-52 (3 $\frac{7}{5}$)
3

15 15

2 9

Answ. *l.* 18 4 (3) 36 15

(5) 12 05

2 09

l. 18-4 Answer.

Here I divide 52 the 3d Number, by 15 the first Number and it quotes 3, and the Remainder is 7, by which 7, after I have multiplied by 3, I multiply *l.* 5-5 the middle Number, and the Product is *l.* 36-15, which I divide by 15, the first Number, at twice, and the last Quotient is *l.* 2-9, which is $\frac{7}{5}$, seven Fifteenths of *l.* 5-5, which is added to the *l.* 15-15, the Product of *l.* 5-5, multiplied by the Quotient 3, and they make *l.* 18-4, as by the common Way. See the Work.

Example 16.

If 45 *l.* buy 15 C. $\frac{3}{4}$ 12 *lb.* of Madder, what will 200 *l.* buy at that Rate?

Common

Thus by one of these short Ways may most Questions in this Rule be answered, and much Time and many Figures saved. I shall now only add some Questions, with their Answers, for the Learner's Practice.

19. If 18 Yards $\frac{3}{4}$ of Serge cost 2 *l.* 5 *s.* how many Yards of the same may I have for 300 Guineas at 21 *s.* 6 *d.* each? Answer 2687 $\frac{1}{2}$ Yards.

20. If 37 Acres of Land let for *l.* 13 11 4, what is that an Acre? Answer 7 *s.* 4 *d.* per Acre.

21. If I have an Estate of 470 *l.* per Annum, what may I expend daily, and yet lay up yearly 130 *l.* Answer 18 *s.* 7 *d.* $\frac{1}{2}$ $\frac{90}{385}$.

22. How many Dozen of Stockings at 11 Groats per Pair, may I buy for *l.* 190 12? Ans 86 Doz. 7 Pr. $\frac{28}{44}$.

23. Bought 6 Chests of Sugar, each 6 *C.* $\frac{3}{4}$, at 56 *s.* per *C.* what come they to? Answer *l.* 113 8.

24. Sold a Piece of Cloth, *qt.* 29 $\frac{1}{2}$ Yards, for *l.* 5 17, what is that per Ell English? Answer 4 *s.* 11 *d.* $\frac{1}{4}$ $\frac{11}{18}$.

25. A owes B *l.* 296 17, but he compounds for 7 *s.* 6 *d.* in the Pound, what must B. receive for his Debt? Answer *l.* 111 6 4 $\frac{1}{2}$.

26. If the Interest of a 100 *l.* for a Year, comes to 6 *l.* what is the Interest of *l.* 315 12 6, for the same Time? Answer *l.* 18 18 9.

27. Bought a Cask of Wine for *l.* 62 8, how many Gallons were in the same, when the Gallon was valued at 5 *s.* 4 *d.* Answer 234 Gallons.

28. What comes the Commission to, of *l.* 490 12, at *l.* 2 $\frac{1}{2}$ per Cent? Answer *l.* 12 5 3 $\frac{1}{2}$.

29. If the whole of a Ship cost *l.* 1270 10, what doth $\frac{3}{32}$ Parts come to at that Rate? Answer *l.* 119 2 2 $\frac{1}{2}$.

30. If A owes B *l.* 395 18, but compounds the whole Debt for *l.* 100 12, what is that in the Pound? Answer 5 *s.* 1 *d.* almost, or *s.* 5 0 $\frac{3}{4}$ $\frac{75}{18}$.

31. What comes *C.* 19 2 12 of Sugar to, at 5 *d.* $\frac{3}{4}$ per Pound? Answer *l.* 50 6 6.

32. Arrived from Turkey, 246 Bales of Tripoly Beladine Raw Silk, weighing one with another, *C.* 2 $\frac{3}{4}$ at *s.* 18 6, the Pound, of 24 Ounces, what do they amount to? Answer *l.* 467 23 12.

33. If I have *l.* 214 a Year, what is that for 19 Weeks? Ans. *l.* 78 3 10 $\frac{8}{52}$.

34. What comes the Insurance of *l.* 642 12 6 to, at 4 Guineas *per Cent.* the Guineas at 21 *s.* 6 *d.* Ans. *l.* 27 12 7 $\frac{3}{4}$.

35. If I buy 100 Yards of Ribbon, at 3 Yards for a Shilling, and 100 of *ditto*, at 2 Yards for a Shilling, and sell it again for 2 Shillings the 5 Yards, the Question is, *Whether I get or lose, and how much?* Ans. I lose 3 *s.* 4 *d.*

36. Shipt for *Jamaica*, 550 Pair of Silk Stockings, at *s.* 11 6 *per* Pair, and 460 Yards of Stuff, at 14 *d.* *per* Yard; in return of which I have had *C.* 46 $\frac{3}{4}$ of Sugar, at *s.* 24 6 *per C.* and 1570 *lb.* of Indigo, at *s.* 2 4 *per lb.* what remains due to me of my *Adventure?* Answer *l.* 102 12 11 $\frac{1}{2}$.

Exported, 343 01 8

Imported, 240 08 8 $\frac{1}{2}$

Difference, 102 12 11 $\frac{1}{2}$

37. How long will 1000 *l.* last me, if I spend no more or less than 3 *s.* 6 *d.* *per.* Day? Answer 15 Years 7 Months, (accounting 30 Days to the Month) and 29 Days, $\frac{1}{2}$ or $\frac{2}{7}$.

38. Shipt for the *Streights*, 100 Pigs of Lead, *qt.* *C.* 283 $\frac{3}{4}$ 12 *lb.*, at *l.* 10 17 *per* Fodder of *C.* 19 $\frac{1}{2}$, what come they to? Answer *l.* 157 18 9 $\frac{3}{4}$ 21 $\frac{1}{4}$.

To Rate Town Taxes.

39. Suppose *A.* hath an Estate of 53 *l.* a Year, and payeth *s.* 5 10 to the Subsidy, what shall *B.* pay, whose Estate is worth 100 *l.* *per Annum?* Ans. 11 *s.* $\frac{4}{3}$.

40. Admit a Tax or Rate of 39 *l.* is laid on a Town for the building of a Bridge; and the Value of the Town Rent is 900 *l.* *per Annum*, what is each Man's Proportion to pay, according to his Rent? If one Man in the Town be worth 100 *l.* a Year, what shall he pay to the said Rate, or 39 *l.*? Answer *l.* 4 6 8.

Profit

Profit and Loss.

41. If I buy a Tun of Wine at 9*l.* per Hoghead, and sell it again at 13*l.* per Hhd. what do I gain per Cent? Answer *l.* 44 8 10 $\frac{1}{2}$, $\frac{6}{9}$ or $\frac{2}{3}$.

Company.

42. Two Partners join Stocks for a certain Time, A puts in 250*l.* B 430*l.* and in Trade they have gained 340*l.* what must each Man have of the Profit, in Proportion to his Money in Company?

$$\begin{array}{r}
 \textit{l. 250. A.} \\
 \textit{430 B.} \\
 \hline
 \text{If } \textit{l. 680} \text{ --- } \textit{l. 340} \text{ --- } \textit{l. 250} \quad \text{Answ. } \textit{l. 125} \\
 \text{If } \textit{680} \text{ --- } \textit{340} \text{ --- } \textit{430} \quad \text{215} \\
 \hline
 \text{Proof, } \textit{340} \\
 \hline
 \end{array}$$

Barter.

43. How many Dozen of Candles, at 5*s.* 2*d.* per Doz. must I give for C. 3 $\frac{1}{2}$ of Tallow, at 37*s.* 6*d.* per C.? Answer 25 Doz. $\frac{25}{2}$.

Whereas a Noble and a Mark, just 15 Yards did buy, How many Ells of the same Cloth for 50 Pounds had I?

Answer. 600 Ells.

If 15 Pounds cost 16 Pence, of Bread that's made of Rye, How many Loaves, of 6 Pounds each, for Four score Pounds had I?

Answer. 3000.

If

If 5 Tuns of Logwood cost 56 Pounds,
How many full Hundreds for 96 Crowns?

Answer 42 C. 3 qrs. 12 lb.

If 15 Hundred of our Lead cost 16 Pounds in Gold,
How much of that Saturnian Ore for 40 Pounds is sold?

Answ. C. 37 $\frac{1}{2}$.

If 30 Pence, and 40 Groats, buy 50 Pints of Wine,
What is the cost of 60 Quarts in current English Coin?

Answer 38 Shillings.

If 9 Pounds of our English Wool doth 90 Pence require,
The Value of 1 C. Weight of you I do desire?

Answer 4 l. 13 s. 4 d.

If the fourth of a Mark buy the half of a Pound,
How much Cochineal can I have for a Crown?

Answer 9 Ounces.

If 16 Shillings and a Crown, for 13 Weeks supply,
For Meat and Drink, that is, my Board, how much a
Day gave I?

Answer 2 d. $\frac{3}{4}$ per Day.

If that a Rule of 3 Feet long doth give 5 Feet in Shade,
And if a Steeple 99, how many Feet is't made?

Answer 59 Feet $\frac{2}{3}$.

To prove the Rule of Three Direct.

Multiply the fourth Number, or Answer to the
Question, by the first; then multiply the second and
third Numbers together, and if the Product be alike,
the Work is right.

For Trial of which, let us prove the First Question:
in this Rule, which was,

If 12 Ells cost 36 s. what 456 Ells?

And

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And the Answer there found, or fourth Number, was 1368 Shillings; the which multiplied by the first Number 12, produces 16416; then multiply also the second and third Numbers together; to wit, 36, and 456, and the Product is also 16416; wherefore the Answer is right.

But observe well, that when there is any Remainder, after you have divided the Product of the second and third Numbers, by the first, such Remainder must, in the Proof be added to the Product of the first and fourth Numbers, which must be equal to the Product of the third Number, multiplied by the second.

Or, Examples may be more intelligibly proved, by varying the Question thus:

If 456 Ells cost £. 68 8 what 12 Ells? Ans. 36s.

As in the second *Example* of this Rule.



C H A P. IX.

The Rule of Three Inverse.

I. **I**N this Rule, the 4th Number sought, bears the same Proportion to the first, as the second does to the third Number.

II. The stating of the Question in this Rule differs not from the Method of Stating in the *Direct Rule*; for the Number that asketh the Question, must be the third Number here, as well as there. And to know when the Question belongs to this *Rule*, and when to the *Direct*, observe this General Rule.

When the Question is stated, consider whether the 4th Number, or Answer, ought to be more or less than the second Number, (which is easily known) if more, then the
least

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least of the two extreams must be your Divisor; but if it ought to be less, then the bigger of the two Extreams must be your Divisor. [*Here the first and third Numbers are called Extreams with respect to the second.*] If the first Number is the Divisor, then the Question belongs to the *Direct Rule*; but if the third is the Divisor, then the Question pertains to the *Rule of Three Inverse*.

III. In this Rule you must multiply the first and second Numbers together, and divide that Product by the third, and the Quotient is the Answer, in the same Name with the middle Number.

In this Rule *Note also*, That when the third Number is less than the first, then the Answer required will be greater than the second.

Or, when the third Number is greater than the first, the Answer will be less than the second.

Example 1.

If 6 Mowers can mow a common Field in 12 Days, in what time will 24 Mowers do it? *Answer*, in 3 Days. *Thus stated*

If 6——require 12——what 24?
6 First Number

Third Num. 24)72(3 Days, the Answer
72
——
(0)

Here I consider the fourth Number, or Number sought, requires less than the second; for the more the Hands the lesser the time, and therefore the greater of the two Extreams must be the Divisor, which is the third Number, therefore the Question is to be answered by the *Rule Inverse*. Wherefore, according to Rule the 3d, I multiply the first and second Numbers together, and divide by the third, and the Quotient is the Answer, *viz*, 3 Days; as in the preceding Work.

Here,

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Here, as the third Number contains the second twice, so doth the fourth contain the first, according to the first *Rule* of this Chapter.

Example 2.

If when Wheat is 4 s. the Bushel, the 20 Penny Loaf weigh 18 lb. what must the said 20 Penny Loaf weigh when Wheat is 6 s. the Bushel? *Answer* 12 lb.

If 4 give 18, what 6?

$$\begin{array}{r} 4 \\ \hline 6 \overline{) 72} (12 \text{ lb. Answ.} \end{array}$$

Here also the fourth Number requires less; for the dearer the Wheat, the lesser or lighter the Loaf: So therefore, the greater of the two Extreame, viz, 6, is the Divisor, which being the third Number, denominates the Question to be *Inverse*.

Example 3.

Admit I lend a Friend on his Occasion, £. 100 for 6 Months, and he promises me the like Kindness when I desire it; but when I came to request it, he could lend me but 75 £. the Question is, to know how long I may keep his Money, to recompence my Courtesy to him? *Answer*, 8 Months.

If 100 give 6, what 75?

$$\begin{array}{r} 6 \\ \hline 75 \overline{) 600} (8 \text{ Months, Answ.} \\ 600 \\ \hline (0) \end{array}$$

Here

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Here it is apparent, the lesser the Sum, the more the Time; and therefore the lesser Extream is the Divisor, which is 75.

Example 4.

How many Dollars at 4 s. 4 d. must be given for 360 Guiltlers; at 2 s. 2 d. *Answer* 180.

s.	d.	s.	d.
If 2	2	give 360,	what 4 4
12		26	12
26		2160	52
		720	

52)9360(180 Dollars

52

416

416

(0)

Here the more the Value, the fewer the Pieces, and therefore the bigger of the Extrems is the Divisor, which is the 3d Number, and therefore it is *Inverse*.

Example 5.

If 100 l. Principal gain 5 l Interest in 12 Months, what Principal will gain as much in 5 Months? *Answer*, 240 l.

M.	l.	M.
If 12	100	5
		12

5)1200

l. 240 Principal, Answer.

Example

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Example 6.

When an Acre of Land doth contain 4 Poles in Breadth, and 40 in Length; what must be the Length when there is 13 Poles in Breadth? *Answ.* 12 P. $\frac{1}{3}$, or 5 Foot, $\frac{1}{3}$. See the Work.

P. B. P. L. P. B.
If 4 give 40, what 13?

$$\begin{array}{r}
 4 \\
 \hline
 13 \overline{) 160} 12 \\
 \underline{13} \\
 30 \\
 \underline{26} \\
 4 \\
 16 \frac{1}{2} \\
 \hline
 64 \\
 2 \text{ the } \frac{1}{2} \text{ of } 4 \\
 \hline
 13 \overline{) 66} 5 \text{ Foot } \frac{1}{3} \\
 \underline{65} \\
 (1)
 \end{array}$$

Here the Breadth is more, and therefore the Length must be less.

Example 7. A Room 30 Foot long and 18 Foot wide, is to be covered with painted Cloth, how many Yards of *Holland Duck* of $\frac{3}{4}$ wide, will cover it?

Answer 240 Foot or 80 Yards.

Example 8. If a Man performs a Journey in 6 Days when the Day is 8 Hours long, in what Time will he do it, when the Day is 12 Hours long? *Answ.* in 4 Days.

Example

Example 9: If 150 Pioneers cast a Trench in 24 Hours, how many must be set on to perform it in 6 Hours? *Answ.* 600 Pioneers.

Ex. 10. If a Piece of Grass will graze 56 Oxen 6 Days, how many must be turned out, that it may last the remaining Oxen 16 Days? *Answ.* 35 Oxen out, 21 stay.

Ex. 11. How much Shalloon, of 3 *qrs.* wide will serve to line 9 Yards of Cloth, of 7 *qrs.* wide? *Answ.* 21 *Yds.*

Ex. 12. If 10 Pounds worth of Wine, at 18 *d.* the Bottle, accommodate 30 Men, how many will the said ten Pounds entertain with Wine at 3 *s.* 6 *d.* the Bottle? *Answ.* 12 $\frac{3}{4}$ Persons.

Ex. 13. If for 5 *l.* 5 *s.* I have 14 C. Wt. carried 136 Miles, how many Miles may I have 24 C. carried for the same Money? *Answ.* 79 $\frac{1}{2}$ Miles.

Ex. 14. In 730 German Rix Dollars, at 4 *s.* 5 *d.* $\frac{3}{4}$, how many Venetian Ducats at 4 *s.* 4 *d.*? *Anf.* 745 $\frac{1}{2}$ $\frac{8}{10}$.

Ex. 15. How many Pounds of Coffee, at 5 *s.* 9 *d.* per lb. is equal in Value to 426 lb. of Tea, at 13 *s.* 4 *d.* per lb.? *Answ.* 987 $\frac{5}{8}$.

Ex. 16. If 60 Ells *English* be equal to a 100 Ells *Flemish*, and each Ell *English* contains 20 Nails of a Yard, how many such Nails doth the *Flemish* Ell contain? *Answ.* 12 Nails.

Ex. 17. If 14 Men in 15 Days, build 16 Rod of Wall, How many Men must be added to do't in 2, that's all? *Answ.* 105 Men.



C H A P. X.

The Double Rule of Three Direct.

QUESTIONS in this Rule have five given Numbers, to find a sixth in-Propotion.

II. Any

II. Any Question in the *Double Rule of Three* may be answered by two *Single Rules of Three*; that is, at two Statings, &c. or by one Rule composed of the five given Numbers.

III. Three of the five given Numbers imply a Supposition, and the other two a Demand.

Example 1.

If 100 *l.* in 12 Months gain 6 *l.* Interest, what will 25 *l.* gain in 4 Months?

Here the Supposition lies on the first Numbers, *viz.* 100, 12, and 6, for it is said, If (or suppose) 100 *l.* in 12 Months gain 6 *l.* Interest; and the Demand lies on the two last Numbers, *viz.* 25 and 4; for it is demanded what will 25 *l.* gain in 4 Months?

IV. In your first stating, you must observe always to make that the second Number, which is of the same Denomination with the Number required; and one of the other Numbers in the Supposition, (it matters not which) must be the first Number; and that Number in the Demand of the same Name with the first, must be the third Number; and then your first stating will stand thus:

l. P. l. l. l. Principal.

If 100 gain 6, what 25?

Here the 2d Number is of the same Name with the Number required; for the Interest of 25 *l.* is required; and the second Number is Pounds Interest: and the first Number is Pounds Principal; and so is the third Number 25, being one of the Numbers in the Demand. And being so stated, I work as in the *Single Rule of Three*, thus:

If

If 12 gain 6, what 4?

$$\begin{array}{r} 4 \\ \hline 12 \overline{)24} \\ \hline \end{array}$$

2 l. Answer.

If 100 l. gain 2 l. what 25 l.

20	s. 40 2d Number
40	1000 Answ. 10 s.

The middle Number in the last Stating is brought into Shillings, otherwise I could not have divided by the first Number.

V. The last Question, or any other in this Rule, may be also answered by a Rule compos'd of the five given Numbers; (as was said in the 11d Rule of this Chapter) after this Manner: State the Question so, that the Numbers may stand in one continued Rank, and in such Order, that the first and fourth Numbers may be of one Denomination, and the second and fifth.

Then multiply the two first Numbers together, for a Divisor; and the three last together for a Dividend, and the Quotient will be the Answer, in the same Name with the middle or third Number; for the Trial of which, let us take the last *Example*, viz.

If

(1) (2) (3) (4) (5)
l. P. M. l. I. l. P. M.
 If 100 in 12, gain 6, what 25 in 4?
 12 2d Numb. 20

 1200

 120

 25 4th Number

 600

 240

 3000

 4 5th Number

 Divisor 12|00)120|00

 10 Shillings Answer.

Here the Question is stated, and worked as before directed; and the Answer is 10*s.* as it was when wrought at two Operations.

If the foregoing Directions are heedfully attended to, they are sufficient for any one's Instruction in the *Double Rule of Three Direct*; and also for the working of any Question therein, by the Rule composed of five Numbers, and therefore I shall only add some Questions, with their Answers, and so proceed to the next Rule.

Example 2. If 750 Bushels of Oats serve 500 Horses, 5 Days, how many Bushels will serve 1000 Horses 14 Days? Answer 4200 Bushels

Ex. 3. If 96 Acres of Grass be mowed by 16 Men in 8 Days, how many Acres will be mowed by 36 Men in 38 Days? Answer 1026 Acres.

Ex. 4. If 1000 lb. of Beef or Pork serve 250 Seamen 7 Days, how many Pounds of *ditto* will serve 550 Seamen 63 Days or 9 Weeks? Answer 19800 lb.

Ex. 5. If a Carrier receive 30*s.* for the Carriage of 3 C. Weight 150 Miles, what must he receive for the Carriage of 7 C. Weight 50 Miles? Answer 23*s.* 4*d.*
Ex. 6.

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Ex. 6. If 100 *l.* in 12 Months gain 5 *l.* Interest, what will 63 *l.* gain in 6 Months at that Rate? *Answer*, 1. 1-11-6.

Ex. 7. If 6 Quarters of Malt are sufficient for a Family of 12 Persons, for 3 Months, how many Quarters will serve a Family of 24 Persons 12 Months? *Answer*, 48 Quarters.

Ex. 8. If a Person takes in 320 *l.* to pay Interest for the same, and at the End of 12 Months, pays for Principal and Interest 1. 339-4; the Question is, at what Rate *per Cent. per Annum* did he pay Interest? *Answer*, 6 *per Cent. per Annum*.

Ex. 9. If 15 *s.* pay 5 Men for 6 Days, how much will pay 20 Men for 10 Days? *Answer*, 5 *l.*

Ex. 10. If 36 Bushels of Wheat in one Year yield 216 Bushels, how much will 36 Quarters yield in 6 Years? *Answer*, 10368 Bushels.



C H A P. XI.

The Double Rule of Three Inverse.

QUESTIONS in this Rule are wrought by two single *Rules of Three*, as those in the foregoing Rule; but you are to observe, that one of the *Statings* (and never but one) will fall out to be *Inverse*, and must be worked accordingly.

Any Question in this Rule also, may be answered by the compound Rule of five Numbers; observing to make the second and fourth Numbers of like Name, and the third and fifth; then multiply the third and fourth Numbers together for a Divisor, and the other three remaining Numbers together for a Dividend, and the Quotient will be the Answer in the same Name with the first Number.

K

Example

Example 1.

If 50 Pioneers in 6 Days cast a Trench 30 Yards long, how many Pioneers will cast a Trench 200 Yards long in 3 Days? *Answer*, $666\frac{2}{3}$ Pioneers.

<i>D.</i>	<i>Pion.</i>	<i>D.</i>	<i>Yds.</i>	<i>Pion.</i>	<i>Yds.</i>
If 6 require 50	what 3	If 30 require 100	what 200		
	6		100		

$3)300$

100

If 30 require 50 what 200. If 6 require $333\frac{1}{3}$ what 3

50

6

$3)1000|0$

$3)2000$

Answer $333\frac{1}{3}$

Answer $666\frac{2}{3}$

Here the Question is answered by two single *Rules of Three*, two different Ways, as in the foregoing Work may be seen; and the first Stating in the first Way falls out to be *Inverse*, but the last in the second Way does not the same; for both Statings are never *Inverse*, as was said before.

Or it may be done by the compound Rule of five Numbers, thus:

(1)	(2)	(3)	(4)	(5)
<i>P.</i>	<i>D.</i>	<i>Yds.</i>	<i>D.</i>	<i>Yds.</i>
If 50	6	30	3	200
		3		6-Second

90

1200

50 First

$9)12000|0$

Answ. $666\frac{2}{3}$ or $\frac{2}{3}$

Example

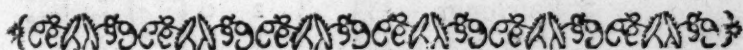
Example 2. If 100 *l.* Principal in 12 Months gain 6 *l.* Interest, what Principal will gain 18 *l.* in 15 Months?

Answer, 240 l.

Example 3. If a Person travels 320 Miles in 10 Days, when the Day is 12 Hours long, in how many Days may he travel 600 Miles, when the Day is 15 Hours long?

Answer, 15 Days.

Example 4. If 36 *l.* serve for the Board of 12 Persons 6 Weeks, how long, or how many Weeks will 260 *l.* serve for the Board of 36 Persons? *Answer 14 $\frac{2}{3}$ Weeks.*



C H A P. XII.

Rules of PRACTICE.

TH E S E Rules are most compendiously contrived for the speedy casting up of any Sort of Goods, or Merchandize; and therefore are of excellent Use among *Merchants, Tradesmen, &c.* for their quick and elegant dispatch of Business; and, from their frequent Use, are called Rules of *Practice*.

Any Question in the *Rule of Three*, that hath a Unit, or 1 for its first Number, may be much sooner done by these brief Rules, than by the Method forward in that, as too much abounding in Figures.

In order for working, the following Tables are to be well understood, and perfectly got by Heart.

The Even Parts of Money.

Parts of a Skill.			Of a Pound.		Parts of a Pound.		
d.					s.	d.	
$\left\{ \begin{array}{l} 6 \\ 4 \\ 3 \\ 2 \\ 1\frac{1}{2} \\ 1 \end{array} \right\}$	is,	$\left\{ \begin{array}{l} \frac{1}{2} \\ \frac{1}{3} \\ \frac{1}{4} \\ \frac{1}{6} \\ \frac{1}{8} \\ \frac{1}{12} \end{array} \right\}$	or	$\left\{ \begin{array}{l} \frac{1}{40} \\ \frac{1}{30} \\ \frac{1}{20} \\ \frac{1}{12} \\ \frac{1}{10} \\ \frac{1}{8} \\ \frac{1}{6} \\ \frac{1}{4} \\ \frac{1}{3} \\ \frac{1}{2} \end{array} \right\}$		$\left\{ \begin{array}{l} 10 \\ 6 \\ 5 \\ 4 \\ 3 \\ 2 \\ 2 \\ 1 \\ 1 \end{array} \right\}$	$\left\{ \begin{array}{l} 0 \\ 8 \\ 0 \\ 0 \\ 4 \\ 6 \\ 0 \\ 8 \\ 0 \end{array} \right\}$
							is
							$\left\{ \begin{array}{l} \frac{1}{2} \\ \frac{1}{3} \\ \frac{1}{4} \\ \frac{1}{5} \\ \frac{1}{6} \\ \frac{1}{8} \\ \frac{1}{10} \\ \frac{1}{12} \\ \frac{1}{20} \end{array} \right\}$
			3 Farthings	$\frac{3}{20}$			
			1 Half-penny	$\frac{1}{8}$			
			1 Farthing	$\frac{1}{20}$			

The Even Parts of Weight.

Pts. of a Tun.		Pts. of C Weight.		Pts. of $\frac{1}{2}$ C. and $\frac{1}{4}$ C.	
$\left\{ \begin{array}{l} 10 \\ 5 \\ 4 \\ 2\frac{1}{2} \\ 2 \\ 1\frac{1}{4} \\ 1 \end{array} \right\}$	is	$\left\{ \begin{array}{l} \frac{1}{2} \\ \frac{1}{4} \\ \frac{1}{5} \\ \frac{1}{8} \\ \frac{1}{10} \\ \frac{1}{16} \\ \frac{1}{20} \end{array} \right\}$	$\left\{ \begin{array}{l} 2 \text{ qrs.} \\ 1 \text{ qr.} \\ 0 \text{ 16 lb.} \\ 0 \text{ 14} \\ 0 \text{ 8} \\ 0 \text{ 7} \\ 0 \end{array} \right\}$	is	$\left\{ \begin{array}{l} \frac{1}{2} \\ \frac{1}{4} \\ \frac{1}{7} \\ \frac{1}{8} \\ \frac{1}{14} \\ \frac{1}{16} \end{array} \right\}$
					$\left\{ \begin{array}{l} 28 \\ 14 \\ 8 \\ 7 \\ 14 \\ 7 \\ 4 \end{array} \right\}$
					is
					$\left\{ \begin{array}{l} \frac{1}{2} \\ \frac{1}{4} \\ \frac{1}{7} \\ \frac{1}{8} \\ \frac{1}{14} \\ \frac{1}{16} \end{array} \right\}$
					$\left\{ \begin{array}{l} \frac{1}{2} \\ \frac{1}{4} \\ \frac{1}{7} \end{array} \right\}$

I. When the Price of the Integer is a Farthing, take the 4th Part of the given Number (or divide it by 4) and the Quotient is Pence, and if any thing remain, it is Farthings, then those Pence divide by 12 and by 20: Or you may take the 6th Part of the given Number, and the Quotient will be three Half-pences, and them divide by 8 and by 20. Or else you may take the 12th Part, and the Quotient will be Three-pences. *Examples of these several Ways follow, viz.*

4)987654 lb. of Cast Iron, at $\frac{1}{4}$ per lb.

12)246913— $\frac{1}{2}$ Rem. because the Dividend was Far-
(things

2|0)2057|6—1 d.

l. 1028-16-1 $\frac{1}{2}$ Answer.

Again.

6)987654

$\frac{1}{8}$)164609 Three Half-pences

2|0)2057|6—1 d. $\frac{1}{2}$ Because the Dividend was Three
(Half-pences

l. 1028-16-1 $\frac{1}{2}$ Answer.

Once more.

12)987654

Three Pences $\frac{1}{4}$)82304-1 $\frac{1}{2}$

2|0)2057|6

Ans. l. 1028 16 1 $\frac{1}{2}$.

I have often observed, that Learners are many times in doubt concerning the several Remainders, what to call, or account them; wherefore let them note once for all, That at any Time, whatever remains, it is always of the same Name with that you account the Dividend; that is, if the Dividend is accounted Farthings, or Pence, or Shillings, &c. so is the Remainder to be reckoned. Or, to represent it more intelligibly, the Remainder is always such a Part of a Shilling (if you take Parts of a Shilling)

as you take for, whether a $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{6}$, $\frac{1}{8}$, or $\frac{1}{12}$; that is the Remainders are either Six-Pences, Groats, Three-Pences, &c. according to the Part you take. And so likewise for the even Parts of a Pound, you may be governed by the same Rules.

II. When the Price given is $\frac{1}{2}d$. then take the 12th Part of the given Number and the Quotient will be Six-Pences; of which take the Half and they are Shillings, which divide by 20, by halving them, &c. to bring them into Pounds.

$ \begin{array}{r} 12 \overline{) 5670} \text{ lb. Copperas, at } \frac{1}{2}d. \text{ per lb.} \\ \underline{472} 3 \\ 2 \overline{) 0} 23 \overline{) 6} \\ \hline l. 11-16 \ 3 \text{ Answer.} \end{array} $	lb. Or thus : $ \begin{array}{r} \frac{1}{2} \overline{) 5670} \text{ Sea-Bread at } \frac{1}{2}d. \\ \hline 1d. \ \frac{1}{12} \overline{) 2835} \\ \hline 2 \overline{) 0} 23 \overline{) 6} - 3d. \\ \hline l. 11-16-3 \text{ Answer.} \end{array} $
---	--

In the second Work I take the $\frac{1}{2}$ of the Half-Pence, and they make Pence, of which I take the $\frac{1}{12}$, a Penny being the $\frac{1}{12}$ of a Shilling, &c.

III. When the Price is 3 Farthings, take the $\frac{1}{2}$ of the given Number of Integers, and that half is 3 Half-pennies, or the 8th Part, and they are Six-pences; which either divide by 8, and by 20, or by $\frac{1}{2}$, and by 20, &c.

$ \begin{array}{r} \frac{1}{2} \overline{) 4720} \text{ Ells Canvas, at } \frac{3}{4}. \\ \hline \frac{1}{8} \overline{) 2360} \\ \hline 2 \overline{) 0} 29 \overline{) 5} \\ \hline l. 14-15 \text{ Answer.} \end{array} $	Or thus : $ \begin{array}{r} \frac{1}{8} \overline{) 4720} \text{ Ells at } \frac{3}{4}. \\ \hline \frac{1}{2} \overline{) 590} \\ \hline 2 \overline{) 0} 29 \overline{) 5} \\ \hline l. 14-15 \text{ Answer.} \end{array} $
--	--

IV. When the given Price is *Pence*, and an even part of a Shilling, consider what Part it is, and divide the given Quantity by it, and the Quotient is Shillings; and those Shillings by 20, &c.

1d $\frac{1}{2}$	549 lb. Iron at 1 d.	3d $\frac{1}{4}$	7654 lb. Soap at 3 d.
	<u>45 9 d.</u>		<u>1913 6</u>
	<i>l. 2 5 9 Answer</i>		<i>l. 95 13 6 Answer</i>
1d $\frac{1}{8}$	369 lb. at 1 d. $\frac{1}{2}$	4d $\frac{1}{3}$	2486 lb. at 4 d.
	<u>46 1 $\frac{1}{2}$</u>		<u>828 8</u>
	<i>l. 2 6 1 $\frac{1}{2}$ Answer</i>		<i>l. 41 8 8 Answer</i>
2d $\frac{1}{2}$	396 Yards Ribbon at 2 d.	6d $\frac{1}{2}$	5769 lb. at 6 d.
	<u>66</u>		<u>2884 6</u>
	<i>l. 3 6 Answer</i>		<i>l. 144 4 6 Answer</i>

Sums in *Practice* admit of various Ways of Working, and equally short, each producing the same Answer, and serve as a Proof to each other, and 'tis very proper, and most concise, to prove *Practice* by *Practice*. It likewise may be proved by the *Rule of Three*; or by reducing the Answer into the same Name with the Price, and divide it by the Price, and the Quotient will be the given Quantity: Or if you divide by the Quantity, the Quotient will be the Price.

V. When the Price of the Integer is Pence, and no even Part of a Shilling, it may be divided into even parts; as 7 Pence is composed of the parts $\frac{1}{4}$ and $\frac{1}{3}$, viz. 3d. and 4d. Wherefore, first take $\frac{1}{4}$ of the given Number, and then the $\frac{1}{3}$ also, and add both Lines together. Likewise 9d. is composed of the Parts $\frac{1}{2}$ and $\frac{1}{4}$, or 6d. and 3d. and of 4d. of 3d. and 2d. &c. Sometimes it is more con-

cise to take Parts of Parts: As suppose 9d. were the Price, I first take $\frac{1}{2}$ for 6, and then the $\frac{1}{2}$ of that $\frac{1}{2}$ for the 3d. because 3d. is the $\frac{1}{2}$ of 6d. and then I add the two Lines together. Or, if the Price were 5 Farthings, I take the $\frac{1}{2}$ for the Penny, and then the $\frac{1}{4}$ of that Line for the Farthings, because a Farthing is $\frac{1}{4}$ of a Penny.

Examples.

	342 lb. Candles at 5d.		429 lb. Loaf Sugar (at 9d.)
3d $\frac{1}{4}$	85 6	6d $\frac{1}{2}$	214 6
2d $\frac{1}{6}$	57 0	3 $\frac{1}{2}$ 6d	107 3
	14 2 6		32 1 9
	l. 7 2 6 Answer		l. 16 1 9 Answer

	679 Yds. Pawing at 7d.		Or thus: 429 lb. at 9d.
3d $\frac{1}{4}$	169 9	6d $\frac{1}{2}$	214 6
4d $\frac{1}{3}$	226 4	3 $\frac{1}{4}$	107 3
	39 6 1		32 1 9
	l. 19 16 1 Answer		l. 16 1 9 Answer

	3790 Yds. Linen at 10d.		Or thus: 12)37900 Yds.
6d $\frac{1}{2}$	1895		
4d $\frac{1}{3}$	1263 4	2)0315 8 4	
	315 8 4		l. 157 18 4
	l. 157 18 4 Answer		

In the last Work I put a Cypher to the given Number, which is multiplying by 10, and the Product is Pence, which I divide by 12 and by 20.

$$\begin{array}{r}
 1349 \text{ lb. Tobacco, at } 11 \text{ d.} \\
 6d \left| \begin{array}{r} 674-6d \\ 449-8 \\ 112-5 \end{array} \right. \\
 \text{of } 4 \text{ d.} \\
 \hline
 123|6-7
 \end{array}$$

l. 61 : 16 : 7 Answ.

Or thus :

$$\begin{array}{r}
 1349 \text{ lb. at } 11 \text{ d.} \\
 10
 \end{array}$$

$$13490$$

$$\text{Odd Penny}-1349$$

$$12)14839$$

$$123|6-7$$

l. 61 : 16 : 7 Answ.

$$\begin{array}{r}
 4796 \text{ Quarts of Beer at } 5 \text{ Farthings.} \\
 1d \left| \begin{array}{r} 399-8 \\ 99-11 \end{array} \right. \\
 \text{of a Pen.} \\
 \hline
 49|9-7
 \end{array}$$

Answ. l. 24 : 19 : 7

VI. When the *Price* is *Pence* and *Farthings* then work for the *Pence* as before ; and for the *Farthings*, observe what *Part* they make, of the *Parts* taken before, which take out of any one of the *Lines*, of which the *Farthing* or *Farthings* make an even *Part*, and add all together.

$$\begin{array}{r}
 856 \text{ Yds. Ribbon, at } (4 \text{ d. } \frac{1}{2} \text{ d}) \\
 d4 \left| \begin{array}{r} 285-4 \\ 35-8 \end{array} \right. \\
 \text{of } 4 \text{ d.} \\
 \hline
 32|1:0
 \end{array}$$

l. 16 : 1 : 0 Answ.

$$\begin{array}{r}
 987 \text{ Yds. Painting, at } (10 \text{ d. } \frac{3}{4}) \\
 6 \left| \begin{array}{r} 493-6 \\ 329 \\ 41-1 \frac{1}{2} \\ 20-6 \frac{3}{4} \end{array} \right. \\
 4 \left| \begin{array}{r} 1 \frac{1}{2} \\ 1 \frac{1}{2} \\ 1 \frac{1}{2} \end{array} \right. \\
 \hline
 88|4-2 \frac{1}{4}
 \end{array}$$

l. 44 : 4 : 2 $\frac{1}{4}$ Answer.

Here I first take the $\frac{1}{3}$ Part of the given Number for the Groat; then for the Half-pence, I consider it is the 8th Part of 4d. wherefore I take the 8th Part of that Line, viz. 285 s. 4d. saying the 8's in 28, &c.

$ \begin{array}{r l} 6d & 479 \text{ lb. Pepper,} \\ & \text{(at } 9d. \frac{3}{4} \\ 3d \frac{1}{2} \text{ of } 6d & 239-6 \\ \frac{3}{4} \text{ of } 3d & 119-9 \\ & 29-11 \frac{1}{4} \\ \hline & 38 9-2 \frac{1}{4} \\ \hline \end{array} $	$ \begin{array}{r l} 6d \frac{1}{2} & 679 \text{ lb. of Cotton at} \\ & (7d. \frac{1}{2} \\ 1 \frac{1}{2} \frac{1}{4} \text{ of } 6d & 339-6 \\ & 84-10 \frac{1}{2} \\ \hline & 42 4-4 \frac{1}{2} \\ \hline \end{array} $
$l. 19:9:2 \frac{1}{4} \text{ Answ.}$	$l. 21:4:4 \frac{1}{2} \text{ Answ.}$

VII. When the Price is any Number of Pence above a Shilling, and not two Shillings, let the given Quantity stand as Shillings, and take even Parts for the Pence, and set the Quotient underneath in proper Order, without drawing a Line, and add it to the given Number, and the Total will be the Answer in Shillings.

Examples.

$ \begin{array}{r l} 1d \frac{1}{12} & 469 \text{ Yds. Stuff, at} \\ & 39-1d. (13d. \\ \hline & 50 8 \text{ s} \\ \hline \end{array} $	$ \begin{array}{r l} 6d \frac{1}{2} & 742 \text{ Yds. at} \\ 1d \frac{1}{8} \text{ of } 6d & 371 (19d. \\ & 61-10 \\ \hline & 117 4-10 \\ \hline \end{array} $
$l. 25:8:1 \text{ Answ.}$	$\text{Answ. } l. 58:14:10$

Here 469 stands as Shillings, of which I take the 12th Part of the Penny, and add both together: In the Example, 742 stands as Shillings, of which I take the $\frac{1}{2}$ for the 6d. and the 6th part of 371, &c.

$$4d. \left| \frac{1}{3} \right| 2460 \text{ lb. Tobacco, at } 820 \text{ (16 d.)}$$

$$\underline{328|0}$$

l. 164 Answ.

Or thus :

$$3)2460$$

$$\underline{5) 820}$$

l. 164

$$\begin{array}{r} 4d. \left| \frac{1}{3} \right| 420 \text{ Ells Holland, at } 140 \text{ (20 d. } \frac{1}{2}) \\ 4d. \left| \frac{1}{3} \right| 140 \\ \frac{1}{2} \left| \frac{1}{8} \right| 17-6 \\ \text{of } 4d. \end{array}$$

$$\underline{71|7-6}$$

l. 35 : 17 : 6 Answ.

$$\begin{array}{r} d. \left| \frac{1}{2} \right| 794 \text{ Bush. of Oats, } 397 \text{ (at 22 d. } \frac{1}{2}) \\ 4 \left| \frac{1}{3} \right| 264-8 \\ \frac{1}{2} \left| \frac{1}{8} \right| 33-1 \end{array}$$

$$\underline{148|8-9}$$

l. 74 : 8 : 9 Answ.

Note, That in the second Work of the first *Example* above, I divide by 15, according to the 9th Rule of the 5th Chapter ; because 16 *d.* is the 15th Part of a Pound, as 15 is the 16th Part. Or when the Price is 14, 16, 18, 21, or 22 *d.* under 2 *s.* if you bring the said Prices into 2 *d.*, 3 *d.*, 4 *d.*, 6 *d.*, or 8 Pence, you may bring them into Pounds, &c. at one Operation, by taking Parts according to the 2d Table of *Practice*, at the beginning of the Rules of *Practice*.

Examples.

7890 Yds. at 14 *d.*

7

988 lb. at 15 *d.*

5

$$2d. \left| \frac{1}{20} \right| 5523|0 \text{ Two Pence } [3d. \left| \frac{1}{80} \right| 494|0 \text{ Three Pence}$$

Answ. l. 460-5

Answ. l. 61-15

6709 lb. at 21 d.

3796 at 22 d.

7

11

$$\begin{array}{r} 3d. \ 8\overset{1}{5} \mid 4696,3 \text{ Three Pences } [2d. \ 1\overset{1}{2}\overset{0}{0} \mid 4175 \mid 6 \end{array}$$

Answ. l. 587-0-9

Answ. l. 347-19-4

VIII. When the Price given is such a Number of *Shillings*, or *Shillings* and *Pence*, as make an even Part of a Pound, divide the given Quantity by that Part, and the Quotient will be Pounds.

Examples.

$$1s. \ 8d. \mid 1\overset{1}{2} \mid 374 \text{ Guild.}$$

746 Gal. Spirits, at 2s.

at 20 d.

Answ. 31-3-4

2s. $1\overset{1}{0} \mid 74 \ 12$ Answ.

In the first of these *Examples*, I divide the given Quantity by 12, because 20 d. is $1\overset{1}{2}$ of a Pound, and there remains 2, which is two 1 s. 8 d's or 3 s. 4 d. So the *Answer* is l. 31-3-4.

IX. When at any Time, the Price is 2 s. as in the second *Example* above, the Answer may be known at Sight; for it's but doubling the last Figure towards the Right Hand, and note it for Shillings, and the other Figures towards the Left Hand are Pounds, as above, the double of 6 is 12 s. and the two other Figures are Pounds, viz. 74 l. in all l. 74-12.

From this Notion of understanding the Value of any Quantity, at 2 s. at Sight, many Things may be very expeditiously answered, viz.

Examples.

Examples.

756 Gal. at 3 s. 6 d. per Gal. 492 Yards at 9 s. 4 d.

75-12 at 2 s.

$\frac{1}{2}$ 37-16 at 1 s.

$\frac{1}{2}$ 18-18 at 6 d.

l. 132- 6 Anfwer.

49-4 at 2 s.

4 times 2 is 8 r.

196 16 at 8 s.

24 12 at 1 s.

4 d. $\frac{1}{3}$ 8 04 at 4 d.

l. 229 12 Answer

3 s. 4 d. | $\frac{1}{6}$ | 576 lb. Indigo,
 ——— (at 3 s. 4 d.
 l. 96 Ans.

1. 96 Ans.

4 s. $\frac{1}{5}$ | 749 pcs. of Eight,
 ——— (at 4 s.
 l. 149-16 Answer

l. 149-16 Answer

$5 s. \frac{1}{4} | 296$ Yds. Silk at $5 s.$ $6 s. 8 d. \frac{1}{5} | 988$ Gal. Brandy
 (at $6 s. 8 d.$)
l. 74 Answer *l. 329-6-8 Anfw.*

l. 74 Answer

l. 329-6-8 *Ans w.*

2s. 6d. $\frac{1}{8}$ | 973 Florins, at 10 s. $\frac{1}{2}$ | 575 Yds. Br. Cloth
 ——— (2 s. 6d. ——— (at 10 s.
 l. 121-12-6 Ans. l. 287-10 Answer

l. 121-126 Ans.

l. 287-10 Answer

Here 5 Half Crowns remain, or 12 s. 6 d.

X. When the Price is Shillings and Pence, or Shillings, Pence, and Farthings, and no even Part of a Pound, then multiply the given Quantity by the Shillings in the Price, and take Parts for the Rest, and add all together.

Examples.

Examples.

756 lb. Coffee, at 5 s. 8 d.

$$\begin{array}{r}
 5 \\
 \hline
 d \overline{) 3780} \\
 4 \overline{) 1} \overline{) 252} \\
 4 \overline{) 1} \overline{) 252} \\
 \hline
 428 \overline{) 4}
 \end{array}$$

l. 214-4 Ansf.

436 lb. Cinnamon,
9 (at 9 s. 7 d.)

$$\begin{array}{r}
 d \overline{) 3924} \\
 6 \overline{) 1} \overline{) 218} \\
 1 \overline{) 1} \overline{) 36-4} \\
 \hline
 417 \overline{) 8-4}
 \end{array}$$

l. 208-18-4 Ansf.

570 Qrs. of Wheat, at
32 (32 s. 6 d.)

$$\begin{array}{r}
 1140 \\
 d \overline{) 1710} \\
 6 \overline{) 1} \overline{) 285} \\
 \hline
 1852 \overline{) 5}
 \end{array}$$

l. 926-5 Ansf.

746 C. Cheese, at
27 (27 s. 4 d.)

$$\begin{array}{r}
 5222 \\
 d \overline{) 1492} \\
 4 \overline{) 1} \overline{) 248-8} \\
 \hline
 2039 \overline{) 0-8}
 \end{array}$$

l. 1019-10-8 Ansf.

XI. When the Price is Shillings and Pence, and no even Part of a Pound, yet many times it may be divided into even Parts; as 7 s. 6 d. is composed of 5 s. and 2 s. 6 d. and 11 s. 8 d. of 10 s. and 1 s. 8 d. 12 s. 6 d. of 10 s. and 2 s. 6 d. 15 s. of 10 s. and 5 s. &c.

Or thus:

205 Gal. Tent, at 7 s. 6 d.

$$\begin{array}{r}
 5 \text{ s.} \overline{) 1} \overline{) 51-5} \\
 2 \text{ s. } 6 \text{ d.} \overline{) 1} \overline{) 25-12-6}
 \end{array}$$

l. 76-17-6

205

$$\begin{array}{r}
 2 \text{ s. } 6 \text{ d. } \frac{1}{8} \overline{) 25-12-6} \\
 [3 \frac{1}{2} \text{ Crowns is } 7 \text{ s. } 6 \text{ d.} \quad 3
 \end{array}$$

l. 76-17-6
190

$$\begin{array}{r}
 190 \text{ Bar. Orgal, at} \\
 \hline
 (11 \text{ s. } 8 \text{ d.}) \\
 10 \text{ s. } \left| \frac{1}{2} \right| 95 \\
 15 \text{ 8d} \left| \frac{1}{2} \right| 15-16-8 \\
 \hline
 \text{L. } 110-16-8
 \end{array}$$

$$\begin{array}{r}
 172 \text{ C. Iron, at} \\
 \hline
 (12 \text{ s. } 6 \text{ d.}) \\
 10 \text{ s. } \left| \frac{1}{2} \right| 86 \\
 2 \text{ s } 6 \text{ d} \left| \frac{1}{8} \right| 21-10 \\
 \hline
 \text{L. } 107-10 \text{ Answer.}
 \end{array}$$

XII. When at any Time the Price is an even Number of Shillings, multiply the Quantity by half of the Price, and double the first Figure of the Product, and set it a-part for Shillings; and the other Figures to the Left Hand will be Pounds.

Examples.

$$\begin{array}{r}
 79 \text{ Bush. Wheat, at } 6 \text{ s.} \\
 \hline
 3 \quad \text{the half } 3 \\
 \hline
 \text{L. } 23-14 \text{ Answer}
 \end{array}$$

$$\begin{array}{r}
 90 \text{ lb. Sarsaparilla at } 8 \text{ s.} \\
 \hline
 4 \quad \text{the half } 4 \\
 \hline
 \text{L. } 36-00 \text{ Answer}
 \end{array}$$

$$\begin{array}{r}
 764 \text{ C. Suff. Cheese at } 12 \text{ s.} \\
 \hline
 6 \quad \text{the half } 6 \\
 \hline
 \text{L. } 458-8 \text{ Answer}
 \end{array}$$

$$\begin{array}{r}
 85 \text{ Yds. of Cloth at } 14 \text{ s.} \\
 \hline
 7 \quad \text{the half } 7 \\
 \hline
 \text{L. } 59-10 \text{ Answer}
 \end{array}$$

$$\begin{array}{r}
 326 \text{ lb. Mace, at } 22 \text{ s.} \\
 \hline
 11 \quad \text{the half } 11 \\
 \hline
 \text{L. } 358-12 \text{ Answer}
 \end{array}$$

$$\begin{array}{r}
 623 \text{ C. Ginger, at } 24 \text{ s.} \\
 \hline
 12 \quad \text{the half } 12 \\
 \hline
 \text{L. } 747-12 \text{ Answer}
 \end{array}$$

When the Multiplier consists of two Places (when the Price is an even Number of Shillings) and that it cannot well be work'd to have the Product in one Line; after you have done with the Unit Figure, and come to multiply by the second, observe to set the first Figure of the Product just under the second of the first Line; for that doubled, and set a-part for Shillings, takes up the first Place.

756 C. of Currants, at 48s.
24

302-8
1512

l. 1814-8 Facit

219 C. at 56s.
28

175-4
438

Answer l. 613-4

When the Price is an even Number of Shillings, if it be required to know what Quantity of any thing may be bought for so much Money, it may be known by this short Rule, *viz.* annex a Cypher to the Money, and divide by half of the proposed Price.

Examples.

How many Pounds of *Indigo* may be bought for 54l. at 4s. per lb.

2)540

Answer 270 lb.

What Quantity of Cloth at 12s. per Yard may be bought for 236l?

6)2360

Yards 393 $\frac{2}{3}$ or $\frac{1}{3}$ Answer

How many Gallons of *Canary* at 6s. per Gallon, may be bought for 250l?

3)2500

833 $\frac{1}{3}$ Answ.

XIII. When

XIII. When the Price is an odd Number of Shillings, work for the even Part, as in the last Rule; and for the odd Shilling take the $\frac{1}{20}$ of the given Number, and add them together, as in the following Examples.

$\begin{array}{r} 96 \text{ Pistoles, at } 17 \text{ s.} \\ \hline 8 \\ \hline 8-1 \end{array}$	$\begin{array}{r} 260 \text{ lb. China Silk, at } 21 \text{ s.} \\ \hline 10 \\ \hline 10-1 \end{array}$	
$\begin{array}{r} \text{s. } 76-16 \\ 1 \frac{1}{20} 4-16 \\ \hline \end{array}$	$\begin{array}{r} 260-00 \\ 1 \text{ s. } \frac{1}{20} 13-00 \\ \hline \end{array}$	
$l. 81-12 \text{ Anfw.}$	$l. 273-00 \text{ Answer}$	

XIV. When the Price of the Integer is Pounds, Shillings, and Pence, reduce the Pounds and Shillings, into Shillings, and multiply the given Number of Integers by the said Shillings: And then take Parts for the Pence as before. Or if the Shillings and Pence make an even Part, or even Parts of a Pound, then multiply the Quantity by the Pounds, and take even Parts of a Pound for the Remainder of the Price, and add the Results together. Or when the Price is Shillings above 20, and under 60, you may let the Integers stand as Pounds, and (without drawing a Line) take Parts for the odd Money, and add all together, &c.

Examples.

C.	l. s. d.	Or thus:
$\begin{array}{r} 426 \text{ Turmeric at } 3-12-6 \\ \hline 72 \\ \hline 852 \\ \text{d. } 2982 \\ 6 \frac{1}{2} 213 \\ \hline 3088 \frac{1}{2} \\ l. 1544-5 \text{ Anfw.} \end{array}$	$\begin{array}{r} 426 \text{ at } 3-12-6 \\ \hline 20 \\ \hline 72 \\ \hline 10 \text{ s. } \frac{1}{2} 213 \\ 2 \text{ s. } 6 \text{ d. } \frac{1}{8} 53-5 \\ \hline l. 1544-5 \text{ Anf.} \end{array}$	$\begin{array}{r} 426 \text{ at } 3-12-6 \\ \hline 3 \\ \hline 1278 \\ \hline 213 \\ \hline 53-5 \\ \hline l. 1544-5 \text{ Anf.} \end{array}$

C.		l. s. d.		Or thus :		C. l. s. d.	
316 Saltpet. at 4-15-6						316 at 4 15 6	
95		20				4	
1580		95		10s		1264	
d 2844				5		158	
6 $\frac{1}{2}$ 158				6d $\frac{1}{10}$		79	
						7 18	
3017 8							
						l. 1508 18 Anf.	
l. 1508-18							

XV. If the Quantity given hath any odd Weight or Measure annexed to it, as $\frac{1}{4}$, a $\frac{1}{2}$ or $\frac{3}{4}$, (after you have work'd as before, for the whole Number) then take $\frac{1}{4}$, a $\frac{1}{2}$, or $\frac{3}{4}$ of the Price, and add it to the other Work.

Example.

lb.		lb.	
256 $\frac{1}{2}$ Legee Silk, at		326 $\frac{3}{4}$ Saffron, at 54s 8d	
15 (15 s 7 d)		54	
1280		1304	
d 256		d 1630	
6 $\frac{1}{2}$ 128		6 $\frac{1}{2}$ 163	
1 $\frac{1}{2}$ 21-4		2 $\frac{1}{3}$ 54-4	
for $\frac{1}{2}$ lb. 7-9 $\frac{1}{2}$		41-0 for the $\frac{3}{4}$ lb.	
$\frac{1}{2}$ 399 7-1 $\frac{1}{2}$		1786 2-4	
l. 199-17-1 $\frac{1}{2}$ Anf.		l. 893-2-4	

When you take the 3 *grs.* of any thing, first take $\frac{1}{2}$ of the given Price, and then the $\frac{1}{2}$ of that $\frac{1}{2}$, and add them together as above. Or you may take the $\frac{1}{2}$ and $\frac{1}{4}$ Parts and add them together; but the other is easier and quickest.

C.		Ells	s. d.
	246 $\frac{1}{4}$ Fustick, at	216 $\frac{1}{5}$ Larvns at 12	9
d	246 (11s 6d	12	
6 $\frac{1}{2}$.	123		$\frac{1}{5} 2-6 \frac{1}{2}$
	$\frac{1}{4} 2-10 \frac{1}{2}$	d 2592	
	2829	6 $\frac{1}{2}$	108
	2-10 $\frac{1}{2}$	3 $\frac{1}{2}$	54
			2-6 $\frac{1}{2}$, $\frac{2}{5}$
$\frac{1}{20}$	283 1-10 $\frac{1}{2}$		275 6-6 $\frac{1}{2}$, $\frac{2}{5}$
l. 141-11-10 $\frac{1}{2}$ Answer		l. 137-16-6 $\frac{1}{2}$, $\frac{2}{5}$ Anfw.	

C.	lb.	s. d.
134 $\frac{1}{2}$	14 Raisins, at	31 6 per Cent.
31	C.	
	$\frac{1}{2}$ 15-9	
134	14 lb. $\frac{1}{4}$ 3-11 $\frac{1}{4}$	
402		
	19-8 $\frac{1}{4}$ for $\frac{1}{2}$ C. 14 lb. 19-08 $\frac{1}{4}$	
417 3-8 $\frac{1}{4}$		
l. 208-13-8 $\frac{1}{4}$ Anfw.		

Here the even Parts of Weight must be observed, as they are set down in the beginning of this Chapter; As for the $\frac{1}{2}$ C. you take half of the Price, and for 14 lb. you take $\frac{1}{4}$ of 15 s. 9d. as it being $\frac{1}{4}$ of $\frac{1}{2}$ a C. &c.

Sums of this Kind, and many others, may as practically be done by *Multiplication* only, (except taking the Parts) as it is taught in the fourth Chapter of this Book.

Examples.

Examples.

C.	s.	d.
75 $\frac{1}{2}$ Nicorago Wood, at 22	6	8
	l. 9	00 0
		9
	81	00 0
	3	07 6
	0	11 3
	l. 84	18 9

Here I multiply, first by 8, and then by 9; 8 times 9 making 72; and for the 3 odd Hundreds wanting, I multiply the Price by 3, and then I take half of the Price for the $\frac{1}{2}$ C. and add them together; as by the Work may be seen.

C.	s.	d.
63 $\frac{3}{4}$ Allom, at 12	10	per C.
		7

Here I multiply by 7, and by 9; 7 times 9 making 63 the Quantity.

	4	09	10
			9
l. 40	08	6	
	6	5	
	3	2 $\frac{1}{2}$	
l. 40	18	1 $\frac{1}{2}$	

<i>Hbds.</i>		<i>Or thus:</i>	
		<i>l.</i>	<i>s.</i>
156	Wine at	12	13
12			10
<i>s.</i>	1872	126	10
10	$\frac{1}{2}$ 78		10
2	$\frac{1}{5}$ 15 12		
1	$\frac{1}{2}$ 7 16	1265	00
		632	10
	<i>l.</i> 1973 08	75	18
		<i>l.</i> 1973 08 Anfw.	

96 Fodder of Lead, at		<i>l.</i> 8-13-4
8		12
768		104-00-0
<i>s. d.</i>	$\frac{2}{3}$ { 32	8
13-4	{ 32	
		<i>l.</i> 832-00-0
<i>l.</i> 832 Answer		

As for short Methods of casting up Bills of Parcels, &c. 'tis best to do them by *Multiplication*, as is directed in that Rule.

Here follow some Questions with their Answers, for the Learner's Exercise.

75 C. $\frac{1}{2}$ 19 lb. at 4 d. $\frac{1}{2}$ per Pound.	<i>l.</i>
71091 lb. at 35 s. 6 d. per C.	Answer 158-18-1 $\frac{3}{4}$
67108 oz. at 16 d. $\frac{1}{4}$ per lb.	Anfw. 1126-13-3 $\frac{3}{4}$
71 lb. 10 oz. 15 dwt. at 5 s. 9 d. } per Ounce.	Answer 283-12-8 $\frac{1}{2}$
319 Yds. at 5 s. 6 d. per Ell.	Answer 248-00-9 $\frac{3}{4}$
419 $\frac{7}{8}$ Yds. at 4 s. 10 d. $\frac{1}{8}$	Answer 70-03-7 $\frac{1}{2}$
47 Quarters, at 4 s. 9 d. per Bush.	Answer 101-13-9 $\frac{1}{8}$
715 $\frac{1}{4}$ Yds. at 4 s. 10 d. $\frac{1}{8}$	Answer 89-06
	Answer 173-04-5 $\frac{7}{8}$
	59 Ounces

59 Ounces, 11 dwt. 18 gr. at 5 s. 7 d. per Ounce.

Ans. l. 16-12-8

50 lb. $\frac{3}{4}$ of Silk, at 20 d. per Oz.

Ans. l. 67-13-4

66 Grofs, at 3 s. 9 d. per Doz.

Ans. l. 148-10-0

56 Load of Hay, at 18 d. per Trufs.

Ans. l. 151-04-0

N. B. 36 Trufs to the Load.

Sold 3 Sacks of Rice, Contents, viz.

N ^o 1-4	1	10	Tare 7	$\left\{ \begin{array}{l} \text{Clough 2 lb. per Sack, Tret} \\ 4 \text{ lb. per } 104 \text{ lb. at } 10 \text{ d. } \frac{1}{2} \\ \text{per lb. Neat.} \end{array} \right.$
2-3	2	19	8	
3-4	0	20	7	

What come the 3 Sacks to?

Ans. l. 56-4-11

For the deducting of *Tare, Tret, &c.* the Learner must have recourse to the VIIth Chapter of this Book.

Sugar, 95 C. 1 qr. 19 lb. Grofs, Tare 12 C. 3 qrs. 10 lb. at 47 s. 6 d. per C. *Nt.* what comes the Sugar to at that Rate?

Ans. l. 196-2-6 $\frac{1}{2}$

Other TABLES of the even Parts of a Shilling and of a Pound.

<i>Parts of a Shilling.</i>			<i>Parts of a Pound.</i>		
$\left\{ \begin{array}{l} 10d. \\ 9 \\ 8 \\ 7\frac{1}{2} \\ 4\frac{1}{2} \end{array} \right.$	is	$\left\{ \begin{array}{l} 5 \\ 4 \\ 3 \\ 2 \\ 1 \\ 10 \\ 9 \\ 8 \\ 7 \\ 6 \end{array} \right.$	18s.	is	9
			17-6d.	is	10
			16 8	is	7
			15	is	8
			14	is	5
			13-4	is	4
			12-6	is	7
			8	is	10
			7-6	is	2
			6	is	3

If the Price of the Integer be at any of the Rates in either of these Tables, multiply the given Quantity by the Numerator, and divide by the Denominator, and the Quotient will be the Answer.

Examples.

Examples.

d
 $10\frac{5}{8}|456$ lb. Loaf Sugar. 746 Yds. paving, at $4d. \frac{1}{2}$
 5 (at $10d$ 3

$6)2280$ $4d. \frac{1}{2}|\frac{3}{8}|2238$

$38|0$ $27|9-9d.$

l. 19 Answer

l. 13-19-9 Answer

Foot lb.
 $9d.\frac{3}{4}|765$ Glazing, at $9d.$ 671 Toppa Soap at $7d. \frac{1}{2}$
 3 5

$4)2295$ $7d. \frac{1}{2}|\frac{5}{8}|3355$

$57|3-9$ $41|9-4 \frac{1}{2}$

l. 28-13-9 Answer

l. 20-19-4 $\frac{1}{2}$ Answer

C. lb.
 $18s.|\frac{9}{10}|695$ Shoemack at $18s.$ 694 Belladine Silk
 9 7 (at $17s. 6d.$

$1|0)625|5$ $17s. 6d. |\frac{7}{8}|4858$

l. 625-10 Answer

l. 607-5 Facit

$6s.|\frac{3}{10}|950$ Pr. Hose at $6s.$ 842 lb. Rhub. at $13s. 4d.$
 3 2

$1|0)285|0$ $13s 4d|\frac{2}{3}|1684$

l. 285 Answer

l. 561-6-8

Other

Other Examples of Practice promiscuously set and
most expeditiously wrought.

Gal.	d.	lb.	d.
d.	4	d.	5
15 is	1536 at 15 p. Gal.	16 is	7490 at 16 p. lb.
$\frac{1}{8}$ of	384	$\frac{1}{5}$ of	1498
a l.		a l.	
	l. 96 Facit		l. 499 $\frac{1}{3}$ Facit

8d. is	7694 lb. Tobacco at	756 Gall. at 5 s 8d.
$\frac{1}{30}$ of	(8d. p. lb.)	
a l.	256-9-4 Facit	

5 s.	$\frac{1}{4}$	189
8d.	$\frac{1}{30}$	25-4

205 Tds. at 7 s. 6d.	l. 214-4 Facit
----------------------	----------------

5 s. $\frac{1}{4}$	51-05	170 lb. Raw Silk at
2s 6d $\frac{1}{8}$	25-12-6	(16 s. 8d.)
of a l.		
	l. 76-17-6 Facit	
10 s. $\frac{1}{2}$	85	
6s. 8d. $\frac{1}{3}$	56-13-4	
	l. 141-13-4 Facit	

40 s.	{ 125 Pcs. at l. 2-5-6 per Piece.
	125

5 s. $\frac{1}{4}$	31-5
6d. $\frac{1}{15}$	3-2-6
of 5 s.	

l. 284-7-6 Facit

245 C. of Hops, at
(3l. 17s. 6d.)

860
Subtr. $\frac{1}{8}$ 26-17-6

s. d.	75 C. $\frac{1}{2}$ Logwood at
2 6 $\frac{1}{8}$	9-07-6 (22s. 6d.)
the $\frac{1}{2}$ C	11-3

l. 84-18-9 Answer.

l. 833-02-6 Facit

Days

<i>Days.</i>	<i>C. qrs. lb.</i>
365 at 5 d. per Day	12 3 14 Long Pepper,
	at l. 3 10 6
6 d. $\left \frac{1}{40} \right $ 9 02 6	12
Subt. $\left \frac{1}{12} \right $ 1 10 5	
	42 06 0
l. 7 12 1 Anf.	$\frac{1}{2}$ C. the $\frac{1}{2}$ 1 15 3
	$\frac{1}{4}$ a $\frac{1}{2}$ of the $\frac{1}{2}$ C. 17 7 $\frac{1}{2}$
	14 lb. the $\frac{1}{2}$ of $\frac{1}{4}$ C. 8 9 $\frac{3}{4}$
26812 lb. at 19 d.	
	Facit, l. 45 07 8 $\frac{1}{4}$
20 d. $\left \frac{1}{12} \right $ 2234 06 8	
Subt. $\left \frac{1}{20} \right $ 111 14 4	
l. 2122 12 4	

	<i>lb.</i>
3796 Yards. at 22 d.	6709 at 21 d.
20 d. $\left \frac{1}{12} \right $ 316-06-8	2 s. $\left \frac{1}{10} \right $ 670 18
2 d. $\left \frac{1}{20} \right $ 31-12-8	Subt. $\left \frac{1}{80} \right $ 83 17 3
l. 347-19-4	for 3 d. over
	l. 587 00 9 Anf.

4 d. $\left \frac{1}{60} \right $	75 C. at 20 s. 8 d.	1 5
4 d. $\left \frac{1}{60} \right $		1 5

l. 77 10 Answer.

When it happens that the Price of the Integer is a known Part of a Pound, as 17 s. 6 d. is $\frac{7}{8}$, 13 s. 4 d. is $\frac{2}{3}$, 16 s. 8 d. is $\frac{5}{8}$, and 7 s. 6 d. is $\frac{3}{8}$, &c. then multiply the given Number by the *Numerator*, and divide the Product by the *Denominator*: Or divide by the *Denominator*, and multiply by the *Numerator*. See the following Work.

L

Examples.

Examples.

$$\begin{array}{r}
 420 \text{ Yds. at } 7 \text{ s. } 6 \text{ d.} \\
 \underline{3} \\
 8)1260 \\
 \underline{} \\
 1157-10 \text{ Facit.}
 \end{array}$$

$$\begin{array}{r}
 \text{Or thus:} \\
 8)420 \\
 \underline{} \\
 52 \quad 10 \\
 \underline{} \\
 3
 \end{array}$$

Answer 157 10

$$\begin{array}{r}
 479 \text{ Ells, at } 7 \text{ s. } 6 \text{ d.} \\
 \underline{7} \\
 8)3353 \\
 \underline{} \\
 1.419 \frac{1}{8}, \text{ or } 2 \text{ s. } 6 \text{ d. Anfw.}
 \end{array}$$

$$\begin{array}{r}
 \text{Or thus:} \\
 \text{Subtract } \frac{1}{8} \\
 \text{from the gi-} \\
 \text{ven Number} \\
 \underline{} \\
 \text{Facit, } 1.419 \quad 02 \quad 6
 \end{array}$$

$$\begin{array}{r}
 697 \text{ Gall. at } 16 \text{ s. } 8 \text{ d.} \\
 \underline{5} \\
 6)3485 \\
 \underline{} \\
 1.580 \frac{5}{8} \text{ or } s. 16-8 \text{ Anfw.}
 \end{array}$$

$$\begin{array}{r}
 \text{Or thus:} \\
 \text{Subtract } \frac{5}{8} \\
 \text{from the gi-} \\
 \text{ven Number} \\
 \underline{} \\
 \text{Facit, } 1.580 \quad 16 \quad 8
 \end{array}$$



C H A P. XIII.

C O M P A N Y.

THIS Rule teaches (by knowing the Parts of which a Joint Stock is composed, with a supposed *Gain* or *Loss*, resulting therefrom by Trade) to estimate or determine each Person's particular Share of the *Gain* or *Loss* in proportion to his Principal in the Joint Stock.

By

By this *Rule* may also a Bankrupt's Estate be divided among his Creditors. Likewise Legacies, &c. adjusted, in Case of a Deficiency of Assets or Effects; and many other Things.

I. Questions in this Rule are work'd by the *Rule of Three*; there being to be as many several Statings, as there are Members in the Joint Stock, if none of their Stocks be alike.

II. The total Sum of the several Stocks is to be the first Number in the *Rule of Three*; the *Gain* or *Loss*, the second, and each Man's particular Stock the third.

Example 1.

A and B enter into Partnership; A puts into Stock 230 *l.* and B 320 *l.* and after 12 Months Trade, they have gained 165 *l.* how much must each Person have of the Gain, in proportion to his Money in Company?

230 *l.* A

320 *l.* B

—
If 550 gain 165, what 230 *l.* A's Stock?

230

4950

330

55|0)3795|0(69 *l.* A's Share.

330

495

495

(0)

L 2

Again,

Again, if 550 *l.* gain 165 *l.* what 320 *l.* B's Stock?

$$\begin{array}{r}
 320 \\
 \hline
 3300 \\
 495 \\
 \hline
 5510 \quad 5280 \quad 96 \text{ B's Share.} \\
 495 \quad 69 \text{ A's Share.} \\
 \hline
 330 \quad 165 \text{ Proof.} \\
 330 \\
 \hline
 (0)
 \end{array}$$

Here I add their several Stocks together, and they make 550 *l.* which is the first Number in the *Rule of Three*; the *Gain*, viz. 165 *l.* the second; and 230 *l.* the Stock of A, the third Number, which makes the first Stating, which being work'd according to Rule, the Answer gives A 69 *l.* for his Share. Then 'tis again repeated, and then the Stock of B 320 *l.* is the third Number; and after working the second Stating, there arises 96 *l.* for the Share of B in the *Gain*, which two Shares being added together, make the total *Gain*, viz. 165 *l.* and is a sure Proof the Work is right; and that each Person had his just Proportion of the Profit.

Example. 2.

Three Persons, A, B, and C, join in Company; A's Money in Stock is 750 *l.* B's 460 *l.* and C's 500 *l.* and after a certain Time, when they settle their Accounts, find their neat Profit 684 *l.* What must each have of the *Gain*?

$$\begin{array}{r}
 750 \text{ l.} \\
 460 \\
 500 \\
 \hline
 \end{array}$$

If 1710 <i>l.</i> gain 684 <i>l.</i> what 750 <i>l.</i>	<i>Ans. l.</i> 300 A
If 1710 gain 684 what 460	184 B
If 1710 gain 684 what 500	200 C

Proof, l. 684

Example

Example 3.

Admit four Persons make a joint Adventure to Sea. *A* sends 60 *l.* in Tobacco, *B* 80 *l.* in Cloth, *C*. 120 *l.* in Leather, and *D*. 140 *l.* in Silk Hose; and after they have disposed of their Returns, their neat Profit amounts but to 72 *l.* what is each Man's Share of the said 72 *l.*?

		<i>l.</i>	<i>s.</i>
If 400 <i>l.</i> gain 72 <i>l.</i> what 60 <i>l.</i>	<i>Ans^w.</i> <i>A</i>	10	16
If 400 gain 72 what 80?	<i>B</i>	14	08
If 400 gain 72 what 120?	<i>C</i>	21	12
If 400 gain 72 what 140?	<i>D</i>	25	04

Proof, l. 72 00

The common Way of having so many Statings and Workings, as there are Partners in the Concern, being intolerably tedious, I have here set down a much more compendious Method of working Sums belonging to this Rule; and though it is derived from *Decimals*, yet it will well enough answer our End by a *Vulgar Operation*, which is this; Annex a Cypher or Cyphers, to the middle Number: (except it be big enough to divide without, which it very rarely is) and then divide it by the first Number, or Total Sum of the Stocks; and then, by that Quotient, multiply each Person's particular Stock; and the Products will be each Man's proportional Share in the *Gain* or *Loss*. But you must observe, that when you have multiplied each Person's particular Stock by the Quotient aforesaid, you must point, or strike off to the Right Hand, so many Figures or Cyphers, as you annex Cyphers to the Sum to be divided.

Or *Examples* in this Rule may be shortened by finding the proportional *Gain* or *Loss*, of one Pound; thus: Bring the *Gain* or *Loss* into Pence, and divide those Pence by the Total of the Stocks, and the Quotient shews what it is *per* Pound; and then the Answers may be found by the Rules of *Practice*, &c.

Example by the said propos'd Method.

For a Specimen, let us take the first *Example* in this Rule, where the Sum of the Stocks was 550*l.* and the total Gain 165*l.* Here I cannot divide 165 by 550; wherefore I join a Cypher to 165, thus, 1650; and then divide it by 550, and the Quotient is 3; by which I multiply 230*l.* the Stock of A, and it produces 690; and the Cypher on the Right Hand being pointed off, for the Cypher annexed to the Dividend, there is left 69*l.* for A's Share in the Gain. Then I multiply B's Stock, 320*l.* by the said Quotient 3, and the Product is 960; then cutting off the Cypher, there remains 96*l.* for B's Share, &c. which are the same Answers as by the other Way.

The 2d *Example* work'd by this shorter Way.

A 750
B 460
C 500 } The Gain is 684*l.*

1710)6840(4 the common Multiplier.
6840

(0)
750 A's Stock.

4

l. 300|0 A's Share of the Gain, ——— l. 300

460 B's Stock.

4

l. 184|0 B's Share of the Gain, ——— l. 184

500 C's Stock.

4

l. 200|0 C's Share of the Gain, ——— l. 200

Proof, l. 684
The

The third *Example* by the shorter Method stands thus:

<i>l.</i>		<i>l.</i>		<i>s.</i>
10 8	} <i>i. e.</i> {	10	Eight Tenths of a <i>l.</i>	} or {
14 4		14	Four Tenths of a <i>l.</i>	
21 6		21	Six Tenths of a <i>l.</i>	
25 2		25	Two Tenths of a <i>l.</i>	
<i>Facit</i> , <i>l.</i> 72 0		72		00

Example. 4.

Divide *l.* 5760-10 among several Persons, so that A may have $\frac{1}{2}$, B $\frac{1}{3}$, C $\frac{1}{4}$, D $\frac{1}{6}$, and E $\frac{1}{8}$, and tell me each Man's Part.

In this, and such like Cases take a Number out of which such Parts may be taken; and take the like Parts of that Number, to find the Number you seek, *viz.* each Man's just Proportion, &c. See the following *Works and Answers.*

20s. Then say, If 27s. 6d.—5760*l.* 10s. what 10s. &c.

<i>Remainders</i>		
10 0	18	2094 14 06 A
6 8	12	1396 09 08 B
5 0	9	1047 07 03 C
3 4	6	698 04 10 D
2 6	21	523 13 07 E
27 6	33 0 66 0(2 <i>d.</i>	
12		<i>Prin. l.</i> 5760 10 00

330

Example. 5.

In like Manner may be done that Question so often critically proposed, *viz.* of dividing 20*s.* into $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, and $\frac{1}{6}$ Parts. See the following *Work.*

L 4

$\frac{2}{3}$

$\frac{1}{3}$ $\frac{4}{5}$

12 If 342 d. pay 20 s. what 120 d. &c.

 $\frac{5}{6}$ $\frac{6}{7}$

6 If 342 pay 20, what 90, &c.

Common 360 Denominator

s. d. Parts.

$$\left. \begin{array}{l} \frac{1}{3} \\ \frac{4}{5} \\ \frac{5}{6} \end{array} \right\} \text{ of } \left\{ \begin{array}{l} 120 \\ 90 \\ 72 \end{array} \right\} \left\{ \begin{array}{l} 7 \text{ } 0 - 72 \\ 5 \text{ } 3 - 54 \\ 4 \text{ } 2 - 180 \\ 3 \text{ } 6 - 36 \end{array} \right.$$

1st Number 342 20 0 342 make 1 to carry, because
in the Rule of 3 (equal to the Divisor 342.

Example 6.

Suppose a Bankrupt's Money and Effects amount to
811 l. 10 s. and he owes to several Persons as follow.
viz.

To Mr. Cruel	—	—	l. 220	16	6
Mr. Gripe	—	—	312	00	9
Mr. Hard	—	—	117	12	6
Mr. Covet	—	—	106	12	6
Mr. Near	—	—	200	06	0
Mr. Squeeze	—	—	124	12	6

l. 1082 00 0

How much must each Person have of the above men-
tioned 811 l. 10 s. in proportion to his Debt?

l. l. s. l. s. d.
If 1082 — 811 10, what 220 16 6?

Ans^r. l. 165 12 4 $\frac{1}{2}$

Or

Or nearer, by seeing first what it comes to in the Pound, (as mentioned in Page 235) and then work each particular Sum by *Practice*. Thus, bring 811 *l.* 10 *s.* into Pence, and then divide them Pence by 1082, the Pounds that are owing, and the Quotient shews what it is in the Pound, *viz.* 15 Shillings. Then proceed for further Solution, thus:

What comes *l.* 220 16 6 to, at 15 *s.* per Pound?

l. 220 16 6 at 15 *s.* per *l.*

<i>s.</i>				
10	$\frac{1}{2}$	110	8	3
5	$\frac{1}{2}$	55	4	$1\frac{1}{2}$

Ans. 165 12 4 $\frac{1}{2}$

And so of the rest, see the following Answer. Or shorter, by taking $\frac{3}{4}$ of each Person's Debt, because 15 *s.* is $\frac{3}{4}$ of a Pound.

Mr. Cruel	must have	<i>l.</i> 165	12	4 $\frac{1}{2}$
Mr. Gripe	— —	234	00	0
Mr. Hard	— —	88	04	4 $\frac{1}{2}$
Mr. Covet	— —	79	19	4 $\frac{1}{2}$
Mr. Near	— —	150	04	6
Mr. Squeeze	— —	93	09	4 $\frac{1}{2}$

Proof *l.* 811 10 0

With Time.

When this Rule hath any Relation to a particular Time, then you must multiply each Man's particular Stock of Money by the respective Times it continues in the joint Stock, and add all the Products together; which Total must be the first Number in the *Rule of Three*; the Gain or Loss the second, and each Man's Stock multiplied by

l. 5

his

his Time, the third; and then work as before, and as often repeat as there are Partners, &c.

Example 1.

A and B enter into *Company*, A puts into Stock 120 *l.* for 7 Months; and B puts 230 *l.* for 10 Months; and in Trading they gain 100 *l.* what is each Man's Share, in Proportion to his Stock and Time? See the Work following.

120 <i>l.</i> A's Stock.	230 B's Stock.
7 Months A's Time.	10 Months B's Time.

840 A's Stock and Time.	2300 B's Stock and Time.
2300	

If 3140—gain 100 *l.* what 840, A's Stock and Time.
Again,

If 3140 gain 100 *l.* what 2300, B's Stock and Time.

				<i>Parts.</i>	
<i>Answer,</i>	}	<i>l.</i> 26	15	00 $\frac{1}{4}$	1660 A
		73	04	11 $\frac{1}{2}$	1480 B

Proof *l.* 100 ————— 3140 *A Far.*

Or the Answers may be known by finding a common Multiplier, as directed in Page 235; or by finding the proportional Part of the Gain due to one Pound, as mentioned in the same Page.

Example 2.

Three Persons enter into Partnership, *viz.* A, B, and C, A puts into Stock 65 *l.* for 8 Months, B 78 *l.* for 12 Months, and C 84 *l.* for 6 Months, and they gain 166 *l.* 12 *s.* what is each Man's Share, &c.

A's Stock multiplied by 8 produces,	520
B's Stock multiplied by 12 gives	936
C's Stock multiplied by 6 produces	504

1960 St. & Ti.
Then,

Then say,

Whole S. and T. *l.* *s.* *l.* *A's* S. and T.

If 1960 gain 166-12 (or 166,6) what 520?

Ans. 44 *l.* 4 *s.* (or *l.* 44,2) &c.



C H A P. XIV.

B A R T E R.

BARTER, or TRUCK, is no more than Exchanging one Commodity for another, and so to proportion their Rates, as that neither of the Parties may sustain Loss.

Example 1.

Suppose A has 144 Ells of Linnen Cloth, worth 15 *d.* per Ell, which he would truck with B for Butter at 18 *s.* 9 *d.* per 100 lb. how many Pounds of Butter must B give A for the Linnen?

Answer, 960 Pounds.

The concise Way to Answer Questions in this Rule is first to find the Value of the first Goods mentioned, by the shortest Way of Practice; and then to Answer it by the Rule of Three.

15 *d.* is $\frac{1}{16}$ of a *l.* $\left\{ \begin{array}{l} 4) 144 \text{ Ells, at } 15 \text{ } d. \\ \hline 4) 36 \\ \hline \end{array} \right.$
l. 9 or 180 *s.*

Then say,

If 18 *s.* $\frac{3}{4}$ give 100 lb. what 180 *s.* *&c.*

Answer, 960 lb.

To

To prove the Work, cast up the 960 lb. at 2 d. $\frac{1}{4}$ per lb. (for so much it is per lb. at 18 s. 9 d. per 100 lb.) and if it amounts to 9 l. the Value of the Linen, the Work is right. Thus :

$$2 d. \frac{1}{4} \text{ of a } l. \quad | \quad 960 \text{ at } 2 d. \frac{1}{4} \text{ per lb.}$$

$$\frac{1}{4} \text{ is } \frac{1}{8} \text{ of } 2 d. \quad | \quad \begin{array}{r} 8 \\ 1 \end{array}$$

l. 9 Facit.

Example 2.

A hath Broad Cloths at 10 l. 10 s. per Piece, B hath Mace at 12 s. per lb. how many Pounds of Mace must B give A for 24 Broad Cloths? *Answ.* 420 Pounds.

$$\begin{array}{r} 24 | 0 \\ 10, 5 \\ \hline \end{array}$$

If 12 s. — 1 lb. what 252 lb. &c.

Example 3.

A hath 14 C. Weight of Sugar, at 6 d. per lb. for which B gave him 1 C. $\frac{3}{4}$ of Cinnamon, what was the Cinnamon rated at per lb.

$$\begin{array}{r} 14 \\ 14 \\ 14 \\ 14 \\ \hline 112 \end{array} \quad 6 d. \frac{3}{4} \text{ of } l. \quad \begin{array}{r} 156, 8 \\ 84 \\ \hline \end{array}$$

If 196 Cost l. 39, 4 what 1 lb. *Answer,* 4 s.

Example

Example 4.

A and *B* barter, *A* hath 86 Gallons of *Brandy*, worth 9s. 2d. per Gallon ready Money, but in Barter he will have 11s. per Gallon; *B* hath *Serge* worth 2s. 1d. per Yard, ready Money, *Quere*, How many Yards of *Serge* must *B* give *A* for his 86 Gallons of *Brandy*?

The Rule. First find what Advance *B* ought to make per Yard for his *Serge*, in Proportion to what *A* hath done upon a Gallon of his *Brandy*. Thus:

If 9s. 2d. increase to 11s. what must 2s. 1d. increase to?

Answer, 2s. 6d.

Then see by Practice what *A*'s *Brandy* comes to at 11s. per Gallon, which will be found to amount to 47l. 6s. then say by the *Rule of Three*.

s.	d.	Yard.	l.	s.
If 2	6	buy 1	what will	47 6 buy?
				Answer, 378 Yards $\frac{2}{3}$

And so of any other *Example* in this Rule of this Kind.



C H A P. XV.

I N T E R E S T,

IS an Allowance of the *Borrower* to the *Lender* in consideration of the use made of the *Lender's* Money; and therefore Interest sometimes is called *Use Money*, and this *Interest* is either *Simple* or *Compound*. *Simple Interest* is that which cometh of the *Principal* only, and *Compound Interest* is that which ariseth from *Principal* and *Interest*

Interest also, and is therefore called *Interest upon Interest*; but, this latter being accounted very unlawful, is seldom allowed, but in some particular Agreements, &c. I shall therefore not insist upon it; but as to the former, to wit, *Simple Interest*, I shall endeavour at some practical Rules and Methods to render it easy to the meanest Capacity; and shew also, that by the Methods of working *Interest*, several other useful things are answered, that do not come under that Denomination.

Example 1.

What comes the Interest of a Bond of $l. 374 \ 12 \ 9$ to, at $6l. \text{ per Cent.}$ for a Year?

Rule. Multiply the principal Money, by the Rate of *Interest*, be it what it will, and divide by 100. State it thus:

<i>l. Pr.</i>	<i>l. In.</i>	<i>l. Pr.</i>	<i>s.</i>	<i>d.</i>
If 100	gain 6,	what 374	12	9
				6

22		47	16	6
		20		

9|56

12

6|78

4

3|12

l. s. d.
22 9 6 $\frac{3}{4}$ $\frac{12}{100}$

Here I multiply the third Number by the second, according to *Multiplication of Money*, and the Product is $l. 2247-16 \ 6$, which I divide by 100, by cutting off two Figures with a Dash of the Pen, which is dividing by 100, according to the 6th *Rule* of the 5th Chapter, then I multiply the several Remainders by 20, by 12, and by 4, and still divide by 100, as before, and the Answer is $l. 22-9-6 \frac{3}{4} \frac{12}{100}$, as may be seen by the Work above.
And.

And the Truth may be proved by stating and working it back again thus :

l. Pr. s. d. l. In. s. d. l. Pr.
If 374 12 9 gain 22 9 6 $\frac{3}{4}$ $\frac{12}{100}$, what 100?

Example 2.

What's the *Interest* of *l. 826 13 9* for a Year, at 5 *per Cent.*

Shorter thus:	41 33 8 9
$\frac{1}{20}$ 82 6 13 9	20
Facit <i>l. 41 6 8 $\frac{1}{4}$</i>	6 68
	12
	8 25
	4
	1 00

} *l. 41 6 8 $\frac{1}{4}$*

In the shorter Method, I consider that the Rate of *Interest*, viz. 5 *per Cent.* is the 20th part of 100 *l.* wherefore I take that part of the principal Money, which is done by halving it, thus: The $\frac{1}{2}$ of 8 is 4, and the $\frac{1}{2}$ of 2 is 1, or 41 *l.* and the 6 cut off is (for the Cypher in $\frac{1}{20}$ 6*s.* and the 13*s.* 9*d.* reduced into Pence, by your Head or Pen, makes 165, and supposing the 5 cut off, the $\frac{1}{2}$ of 16 is 8 Pence; and 5 reduced into Farthings make 20, and supposing the 0 to be cut off from that likewise, the $\frac{1}{2}$ of 2 is $\frac{1}{4}$, and so the Answer is the same with the other, viz. *l. 41-6-8 $\frac{1}{4}$* , and the most concise Method that can be.

Example

Example 3.

What's the Simple Interest of
l. 34|8 13 2 at 6 per Cent?

$$\begin{array}{r} 17\ 08\ 7\ \frac{3}{4} \\ 3\ 09\ 8\ \frac{3}{4} \end{array} \left. \vphantom{\begin{array}{r} 17\ 08\ 7\ \frac{3}{4} \\ 3\ 09\ 8\ \frac{3}{4} \end{array}} \right\} \begin{array}{l} \frac{1}{20} \text{ for 5 per Cent.} \\ \frac{1}{5} \text{ for 1 per Cent.} \end{array}$$

Facit, *l.* 20 18 4 $\frac{1}{2}$

Example 4.

What's the Interest of *l.* 746-12-6 at 5 $\frac{1}{2}$ p. C.

$$\begin{array}{r} 5 \\ \hline 3733-02-6 \\ \text{The } \frac{1}{2} \text{ of } 746\ \text{l. } \&c. \quad 373-06-3 \\ \hline \end{array}$$

Sooner thus:

$$\begin{array}{r} 74|6\ 12\ 6 \\ \hline \frac{1}{20} \left| \begin{array}{r} 37\ 06\ 7\ \frac{1}{2} \\ 3\ 14\ 7\ \frac{3}{4} \end{array} \right. \\ \hline \end{array} \quad \begin{array}{r} 41|06-08-9 \\ 20 \\ \hline 1|28 \\ 12 \\ \hline 3|45 \\ 4 \\ \hline 1|80 \end{array} \left. \vphantom{\begin{array}{r} 41|06-08-9 \\ 20 \\ \hline 1|28 \\ 12 \\ \hline 3|45 \\ 4 \\ \hline 1|80 \end{array}} \right\} \text{ } l. 41-1-3\ \frac{1}{4}$$

l. 41 01 3 $\frac{1}{4}$ *facit*.

Thus by either of these Ways may the Interest of any Sum of Money, for a Year, be found, at any Rate per Cent. Likewise by the same Method of Working, may the Provision, Commission, or Factorage of any Sum be known; As also Insurance, Avarage, Storage, Brokerage, or any thing else, rated at so much per Cent.

What

What is the Factorage of Goods bought, or otherwise negotiated, to the Value of *l.* 479 16 9 at 2 *p.* Cent.

479 16 9

9|59 13 6

20

Or thus:

2 *p.* C. | $\frac{1}{50}$ | 47|9 16 9

11|93

12

Facit, *l.* 9 11 11

— Answ. 9-11-11.

11|22

What is the Insurance of 230 *l.* at 10 $\frac{1}{4}$ per Cent.
l. 2300 — 10 per Cent.

115

57 10

24|72 10

20

14|50

12

6|00

l. 24 14 6

Or thus:

10 per Cent. *l.* 23|0

10s | $\frac{1}{20}$ | 1 3

5s | $\frac{1}{2}$ | 11 6

l. 24 14 6

This Method may be of good Use for taking off 5 per C. for prompt Payment in Custom-House Duties, and 15 per Ct. the additional Duty on French and East-India Goods.

Admit I were to take off 5 *p.* Ct. from *l.* 275 12

Subtract $\frac{1}{20}$ 13 15 07

Answer, *l.* 261 16 05

Again, take off 15 per Cent. from *l.* 672 16 08

$\frac{1}{10}$ 67 05 08

$\frac{1}{2}$ 33 12 10

Subtract 100 18 06

Answer, *l.* 571 18 02

Once

Once more, take 25. *per Ct.* from *l.* 321 12 4

$$\begin{array}{r} 5 \text{ per Ct. } \frac{1}{20} \quad 16 \quad 01 \quad 7 \frac{1}{4} \\ \hline 5 \end{array}$$

Deduct 80 08 0 $\frac{1}{4}$ 25 *p.C.*

Answer, *l.* 241 04 3 $\frac{3}{4}$

Example 5.

What comes the Interest of *l.* 446 12 to, for 9 Months, at 6 *per Cent. per Annum*?

Here I take the $\frac{1}{3}$ of the Year's Interest for 6 Months, and then the $\frac{1}{3}$ of that for 3 Months, and add them together for 9 Months, as in the following Work.

l. 446 12
6 *per Cent.*

$$\begin{array}{r} 26 \overline{) 79 \text{ } 12} \\ 20 \end{array}$$

$$\begin{array}{r} 15 \overline{) 92} \\ 12 \end{array}$$

$$\begin{array}{r} 11 \overline{) 04} \end{array}$$

l. 26 15 11 $\frac{4}{100}$ for a Year.

6 *Mo.* 13 07 11 $\frac{1}{2}$ for $\frac{1}{2}$ a Year.

3 *Mo.* 6 13 11 $\frac{1}{4}$ for $\frac{1}{4}$ ditto.

l. 20 01 11 $\frac{1}{4}$ for 9 Months.

Example 6.

To what comes the Interest of *l.* 297-12 at 5 *per C.* for 6 months?

l. 14 17 7 for a Year.

Take $\frac{1}{2}$ for 6 Months, *l.* 7 08 9 $\frac{1}{2}$ Answer.

When

When at any time the Rate of Interest hath $\frac{1}{4}$, $\frac{1}{2}$, or $\frac{3}{4}$ annexed, you must first multiply by the whole Number, and then take $\frac{1}{4}$, $\frac{1}{2}$, or $\frac{3}{4}$ of the principal Money, (as is taught in the 13th Rule of the 4th Chapter) and add the two Lines together, and then divide by 100, as before.

Example 7.

What is the Interest of $l. 376 \ 12 \ 6$
at $4 \frac{1}{2}$ per Cent? 4

For the $\frac{1}{2}$ per Cent. take $\left\{ \begin{array}{l} 1506 \ 10 \ 0 \\ 188 \ 06 \ 3 \end{array} \right.$
half of the principal.

$16 \overline{) 94 \ 16 \ 3}$
20

$18 \overline{) 96}$
12

Ans^w. $l. 16-18-11 \frac{1}{2}$. $\left\{ \begin{array}{l} 11 \overline{) 55} \\ 4 \end{array} \right.$

$2 \overline{) 20}$

Example 8.

What is the Interest of $l. 226 \ 10 \ 0$
at $3 \frac{3}{4}$ per Cent? $3 \frac{3}{4}$

per C. $\begin{array}{r} 679 \ 10 \ 0 \\ \frac{1}{2} \frac{1}{2} \overline{) 113 \ 05 \ 0} \\ \frac{1}{4} \frac{1}{2} \overline{) 56 \ 12 \ 6} \end{array}$

$8 \overline{) 49 \ 07 \ 6}$
20

$9 \overline{) 37}$
12

Ans^w. $l. 8-9-10 \frac{1}{2}$. $\left\{ \begin{array}{l} 10 \overline{) 50} \\ 4 \end{array} \right.$

$2 \overline{) 100}$

Another

Another Way, (when the Time is odd or not just a Year) is to multiply the Principal by the Interest of 100*l.* for the nominated Time, cutting off two Figures to the Right Hand; as before.

Example 1.

What's the Interest of *l.* 234 12 6 for 2 Years at 5 per Cent. The Int. of 2 } 10*l.*
Years at 5 per Cent. }

$$\begin{array}{r}
 2346050 \\
 \hline
 20 \\
 \hline
 925 \\
 12 \\
 \hline
 300
 \end{array}
 \left. \vphantom{\begin{array}{r} 2346050 \\ 20 \\ 925 \\ 12 \\ 300 \end{array}} \right\} \text{ } l. 2393$$

Example 2.

What's the Interest of *l.* 312 16 for 5 Years, at 6 per Cent. ? 5 and 6

Answ. *l.* 93 16 9½

$$\begin{array}{r}
 15640 \\
 \hline
 6 \\
 \hline
 93840 \\
 20 \\
 \hline
 1680 \\
 12 \\
 \hline
 960 \\
 4 \\
 \hline
 240
 \end{array}
 \left. \vphantom{\begin{array}{r} 15640 \\ 6 \\ 93840 \\ 20 \\ 1680 \\ 12 \\ 960 \\ 4 \\ 240 \end{array}} \right\}$$

Here the Interest of 100*l.* for the Time, is 30*l.* therefore I multiply by the Ratio's of 30, viz. 5 and 6; as in the Example.

Example.

Example 3.

What's the Interest of $l. 428 \ 14$ for 9 Mon. at 4 per C.
 The Inter. of 100 $l.$ } is 3 $l.$
 for 9 Mon. at 4 p. C. }

$$\begin{array}{r} 12 \overline{) 86} \quad 2 \\ \underline{20} \end{array}$$

$$\begin{array}{r} 17 \overline{) 22} \\ \underline{12} \end{array}$$

$$\begin{array}{r} 2 \overline{) 64} \\ \underline{4} \end{array} \left. \vphantom{\begin{array}{r} 17 \overline{) 22} \\ \underline{12} \end{array}} \right\} l. \ 12 \ 17 \ 2 \ \frac{1}{2}$$

$$\begin{array}{r} 2 \overline{) 56} \end{array}$$

When the Rate is at $\left\{ \begin{array}{c} 5 \\ 6 \\ 4 \\ 3 \end{array} \right\}$ per C. for $\left\{ \begin{array}{c} 12 \\ 10 \\ 15 \\ 20 \end{array} \right\}$ Months

Then the Interest of any Principal, is just so many Shillings as there are Pounds; therefore only take $\frac{1}{20}$ of the Principal, &c.

Example 1.

What's the Interest of $l. 412 \ 06 \ 9$, at 5 per Cent. for 12 Months?

$$\begin{array}{r} \frac{1}{20} \overline{) 20 \ 12 \ 4 \frac{1}{20}} \text{ Answer.} \end{array}$$

Example 2.

What's the Interest of $l. 324 \ 12 \ 0$, at 6 per Cent. for 10 Months?

$$\begin{array}{r} \frac{1}{20} \overline{) 16 \ 04 \ 7 \frac{1}{20}} \text{ Answer.} \end{array}$$

Example

Example 3.

What's the Interest of ——— *l.* 428 16 4 at
4 *per Cent.* For 15 Months?
 $\frac{1}{20}$ 21 08 $9\frac{3}{4}$ Answ.

Hence it necessarily follows, that the Interest of any given Principal may be found, by taking Parts for the Time proposed, out of the Time mentioned in the foregoing Table; thus: If the Interest of *l.* 412 6 9 for 12 Months, be *l.* 20-12-4 *d.* $\frac{1}{2}$, as above, at 12 *d.* in the Pound, then for 6 Months it must be $\frac{1}{2}$, *viz.* *l.* 10-6-2 $\frac{1}{4}$; and for 3 Months $\frac{1}{4}$.

Examples.

What's the Interest of ——— 20)276 05 9 for 4 Mon.
at 5 *per Cent.*

4 Mon. $\frac{1}{3}$ of	13 16 3 $\frac{1}{4}$
12 Mon.	<i>l.</i> 4 12 1 Answ. for 4 m.

Again, what's the Interest of 20)157 09 0 for 5 Months, at 6 *per Cent.*

5 Mon. $\frac{1}{2}$ of	7 17 5 $\frac{1}{4}$
10 Mon.	<i>l.</i> 3 18 8 $\frac{1}{2}$ Answ.

And so for 4 or 3 *per Cent.* for 15 or 20 Months, in the same Manner.

When the *principal Money* is any Number of Pounds, without *Shillings* or *Pence*, then it may be done by the following Method of working.

Example

Example 1.

What's the Interest of 40 *l.* for 7 Years, 5 Months, and 26 Days, at 6 *per Cent. per Annum*?

<i>Years.</i>	<i>Mon.</i>	<i>Days.</i>
7	5	26
12 Months in a Year.		

89
30 Days in a Month.

2696
40 Principal Money.

1 00)1078 40
Groats 6 0)107 8
in all.

l. 17 58 Groats, or 19 *s.* 4 *d.* and 1 *d.* $\frac{1}{2}$ for the Fraction.

Here the Time is set down, and multiplied by 12, the Calendar Months in a Year, and the odd Months taken in, and then by 30, the supposed Days in a Month, and the odd Days taken in likewise, which Product of Days is multiplied by the principal Money, *viz.* 40 *l.* which Product is divided by a 100, and then that Quotient by 60, the Groats in a Pound, and the Remainder is Groats, *viz.* 58, which is 19 *s.* 4 *d.* and 1 *d.* $\frac{1}{2}$ for the Fraction, in all *l.* 17-19-5 $\frac{1}{2}$: As in the Work.

Example 2.

What's the Interest of 590 *l.* for 3 Years, 7 Months, and 19 Days at 6 *per Cent. per Annum*?

Years.

<i>Years.</i>	<i>Mon.</i>	<i>Days.</i>
3	7	19
12 Months in a Year.		

43	
30	Days in a Month.

1309	
590	Principal Money

117810
6545

1 00)7723 10

6 0)772 3

Answ. l. 128-43 Groats, or 14 s. 4 d. In all,
l. 128-14-4

There is also another Way of calculating *Interest*, by Days, which is thus: Bring the *Principal Money* into Pence, then multiply those Pence by the Days it is out at Interest, and if the Rate be 6 per Cent. then divide by 6083, which is what is produced by the Days of a Year multiplied by 100, and divided by the Rate of Interest; but if the Rate be 5 per Cent. then divide by 7300.

Example.

What is the Interest of 150 l. for 10 Months and 24 Days, at 5 per Cent. per Annum?

	Mo.	Days.
<i>l.</i> 150	10	24
20	30	
3000	324	
12		
36000	12)	
324 Days at Interest.	73 00)116640 00(1597	
	13 3 1	
144000		
72000		
108000		
11664000		

Ans^w. l. 6-13-1

Another Rule by Days.

Multiply these three Numbers continually, *viz.* the given Interest of 100*l.* for a Year; the Principal whose Interest is required; and lastly, the Number of Days, required; and the last Product is to be reserved for a Dividend. Then multiply 365 Days by 100, (which is only annexing two Cyphers) and let that Product be your Divisor; (which serves for all Rates) and then divide as usual, and the Quotient will be the Interest sought.

Note here, That the two Principals, *viz.* 100*l.* and the other proposed, are supposed to be of one Denomination; also the Interest required will be of the same Name with the given Interest of 400*l.*

Example.

What's the Interest of 400*l.* for a Week, or 7 Days, at 6 *per Cent. per Annum*?

M

365

256

Interest.

Chap. 15.

$\begin{array}{r} 365 \\ 100 \\ \hline \end{array}$	$\begin{array}{r} 400 \\ 6 \\ \hline 2400 \\ 7 \\ \hline \end{array}$
36500 Divisor	)16800(Dividend.

Ans.

$$36500)16800,000(,4602, \text{ or } 9 \text{ s. } 2 \text{ d. } \frac{1}{4}$$

Here, in valuing, the Farthings are always lessened by one.

When the Rate is 5 s. *per Cent.* take the $\frac{1}{4}$ of the Principal, and work as before.

What is the *Brokerage* of l. 465 12 6
at 10 s. *per Cent.*

$$\begin{array}{r} \frac{1}{2} | 2 | 32 \quad 16 \quad 3 \\ \hline 20 \end{array}$$

$$\begin{array}{r} 6 | 56 \\ \hline \end{array}$$

$$\left\{ \begin{array}{r} 12 \\ \hline 6 | 75 \\ 4 \\ \hline \end{array} \right.$$

Answ. l. 2-6-6 $\frac{3}{4}$

$$\begin{array}{r} 3 | 00 \\ \hline \end{array}$$

If you would know what any Sum comes to, at 30, 40 or 50 *per Cent.* first see what it comes to at 10 *per Cent.* and then multiply that Answer by 3, 4 or 5, &c.

Example.

Example.

What comes *l.* 726 10 6 to, at 40 *per*
10 (Cent.

l. 72-13-0 $\frac{1}{2}$ 10 *per Ct.*

4

l. 290-12-2 Answer.

72|65 05 0

20

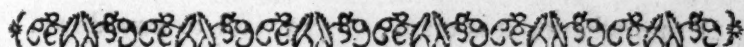
13|0|5

12

60

4

2|40



C H A P. XVI.

D I S C O U N T,

IS when a Sum of Money hereafter due, is satisfied by paying down so much present Money, which if put to Interest, at such a Rate, and for such a Time, would encrease itself to the Sum first due.

Example 1. What is the *Discount* of *l.* 487-12 for six Months, at 6 *per Cent. per Annum*?

To answer this, and other Sums of the same kind, the general Rule is, to make 12 Months the first Number in the *Rule of Three*, the Rate of *Interest* the second, and the discounted Time the third.

If 12 Months give 6 *l.* what 6 Months?

6

12)36

3 To be added to 100 *l.* the first
M 2 Numbe

Number in the next Work. Then say again, if 103 *l.* abate 3 *l.* what *l.* 487-12. Answer *l.* 14-4 Discount. See the following Proof.

After I find the Discount to be *l.* 14-4, I deduct it from the Sum first due, viz. *l.* 487-12, and the Remainder is the present Money to be paid down: And for the Proof of the Assertion in the first Rule, I take the Sum to be paid down, and calculate it at 6 *per Cent.* the Rate of Interest propos'd, and the Answer is *l.* 28-8, the Interest for a Year; the $\frac{1}{2}$ of which for six Months, (the Time discounted) is *l.* 14-4, the *discounted Sum*: As by the following Work.

l. 487 12 first due.
14 04 discounted.

From whence it is manifest, no one allows Interest for any more Money than he receives.

473 08 to pay down.
6 *per Cent.*

28|40 8
20

8|08

Int. for a Y. *l.* 28-8

$\frac{1}{2}$ for 6 Mo. *l.* 14-4 Proof.

Ex. What is the Discount of 275 *l.* 10 *s.* for 7 Months, at 5 *per Cent.* *per Annum.*

5 *l.* *per Cent.*

6 Mo. | $\frac{1}{2}$ | 2 10
1 Mo. | $\frac{1}{6}$ | 0 8 4

l. 2 18 4

If £. 102-18-4 abate £. 2-18-4, what £. 275-10?

Ans. £. 7-16-1.

First due, £. 275-10

Discounted, 7-16-1

Paid down, 267-13-11

5 p. C.

13|38-09-07

20

7|69

12

8|35

4

1|40

Interest *l. s. d.*
13 7 8 $\frac{1}{4}$

6 Mo. $\frac{1}{2}$ 6-13-10

1 Mo. $\frac{1}{8}$ 1-02-03

Proof, 7-16-01

Example 3.

Bought Goods to the Value of £. 109-10, on 9 Months Discount, at 6 per Cent. per Annum, what must be paid down?

6 l. per Cent.

6 Mo. $\frac{1}{2}$ 3 00

3 Mo. $\frac{1}{4}$ 1 10

4 10

100

If £. 104 10 abate £. 4 10, what 109 10 0?

Ans. 4 14 3

Answer, to be paid down £. 104 15 9

Example 4.

Sold Goods amounting to *l.* 217-12, on two 3 Months Discount, (that is, half at 3 Months, and the other half 3 Months after that) at 5 *per Cent. per Annum*, what must be paid down?

5 <i>l. per Cent.</i> $ \begin{array}{r} 3 \text{ M. } \frac{3}{4} \text{ } 1 \text{ } 5 \\ \hline 100 \text{ } 0 \\ \hline 101 \text{ } 5 \end{array} $	If <i>l.</i> 101-05 abate <i>l.</i> 1-5, wt. 108-16 Ans. <i>l.</i> 1-06-10 Disc. $ \begin{array}{r} l. \text{ } 217 \text{ } 12 \\ \hline 108-16 \end{array} \left. \vphantom{\begin{array}{r} l. \text{ } 217 \text{ } 12 \\ \hline 108-16 \end{array}} \right\} 2 \text{ Parts.} $
---	---

Again.

If *l.* 102-10 dif. *l.* 2-10, what *l.* 108-16

Answ. *l.* 2-13-0 Disc.

5 <i>per Cent.</i> $ \begin{array}{r} 6 \text{ M. } \frac{1}{2} \text{ } 2 \text{ } 10 \\ \hline 100 \text{ } 00 \\ \hline 102 \text{ } 10 \end{array} $	217-12 val. sold $ \begin{array}{r} l. \text{ } 108-16 \text{ for } 3 \text{ m. } \quad 1-06-10 \text{ Disc.} \\ 108-16 \text{ for } 6 \text{ m. } \quad 2-13-00 \text{ Disc.} \\ \hline \text{Total Discount, } \quad 3-19-10 \\ \hline \text{Paid down, } l. \text{ } 213-12-02 \text{ Ans.} \end{array} $
---	---

In the foregoing Example, I first divide the given Sum into two equal Parts, by taking the half of it; then for 3 Months I take $\frac{3}{4}$ Part of the Rate, viz. 5 *per Cent.* and it makes *l.* 1-5. Then I add that *Facit*, to 100 *l.* and make the first *Stating*, saying, if *l.* 101-5 Discount *l.* 1-5, what *l.* 108-16? and the Answer is *l.* 1-6-10, for the first 3 Months Discount. Then for 6 Months I take the $\frac{1}{2}$ of the Rate, and it makes *l.* 2 10: Then I say again, if *l.* 102-10 abate *l.* 2-10, what *l.* 108-16? and the Answer is *l.* 2-13 for 6 Months Discount. Then I add the two Discounts together, and subtract the Total from the Sum first due, and the Remainder is *l.* 213-12-2 to be paid down presently. Which may be seen by the Work.

When

When the Payments are to be made at three several Times, then divide the given Sum into three equal Parts, and work as before ; and if at 4 Payments, then divide the Sum into 4 equal Parts, &c.

There is another and better way, when the Rate is at 6 *per Cent.* Discount, which is thus :

Bring the given Sum into Pence, and then multiply those by the Time, which Product divide by 200, and the Time added together, and the Quotient will be the Answer in Pence, which reduce into Pounds, &c.

Example 5.

For Trial, let us take the first Example in this Rule, *viz.*

What is the Discount of $\text{£} 487\ 12$
for 6 Months, at 6 *per Cent.*

$$\begin{array}{r}
 \begin{array}{r}
 200 \\
 \hline
 6
 \end{array}
 \qquad
 \begin{array}{r}
 117024 \text{ Pence.} \\
 6 \text{ Months Time} \\
 \hline
 206702144 (3408 \text{ Pence} \\
 618 \\
 \hline
 12)3408 \text{ Pence} \\
 \hline
 28 \overline{)4} \\
 \hline
 \text{Discount } \text{£} 14-4
 \end{array}
 \qquad
 \begin{array}{r}
 20 \\
 \hline
 9752 \\
 12 \\
 \hline
 117024 \text{ Pence.} \\
 6 \text{ Months Time} \\
 \hline
 206702144 (3408 \text{ Pence} \\
 618 \\
 \hline
 841 \\
 824 \\
 \hline
 1744 \\
 1648 \\
 \hline
 (96)
 \end{array}
 \end{array}$$

$\text{£} 487\ 12$ First due
 $\text{£} 14\ 04$

Answ. $\text{£} 473\ 08$ to pay down

M 4

A third

A third Way of Discount is to multiply 12 Months by 100, (which is only annexing two Cyphers to 12) and divide the Quotient by the Rate of Discount, and to that Quotient add the Time proposed; which Sum reserve for a Divisor: Then multiply the Sum to be discounted by the proposed Time, and divide that Product by the above-mentioned Divisor.

Example 6.

What's the Discount of *l.* 487-12, for 6 Months, at 6 per Cent. per Annum, (the first Example in this Rule)?

Sum to be		{ <i>l.</i> 487 12
12 Discounted,		{ 6 Months
100		
Rate—	206	2925 12 (<i>l.</i>
6)1200		206
200		865
Time added 6		824
Divisor, 206		41
		20
<i>Ans. l.</i> 14-4 to be disc.		832 (4 s.
		824
		(8)

Example 7.

What present Money will discharge a Debt of 122 *l.* 11 s. 4 d. due at 3 Months, discounting after the Rate of 6 per Cent. per Annum? Answer, *l.* 120-15-1 $\frac{1}{2}$.

After the last Method of Operation.

	<i>l.</i>	<i>s.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>	
Divisor, 203)	367	14	(1	16	2 $\frac{1}{2}$	Discount.
	<i>£c.</i>					<i>Example</i>

Example 8.

What's the Discount of *l.* 275-10, for 7 Months, at
5 *per Cent. per Annum*?

Answ. *l.* 7-16-1 $\frac{3}{4}$.

As before.

l. *s.* *l.* *s.* *d.*
Divisor, 247) 1928 10 (7 16 1 $\frac{3}{4}$ Discount.
£c.

For	$\left\{ \begin{array}{c} 2 \\ 3 \\ 4 \\ 5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \end{array} \right\}$	$\left\{ \begin{array}{c} \text{per Cent.} \\ \text{Discount.} \end{array} \right\}$	$\left\{ \begin{array}{c} 600 \\ 400 \\ 300 \\ 240 \\ 200 \\ 171 \\ 150 \\ 133 \\ 120 \end{array} \right\}$	with the Time ad- ded, is the Divisor.
-----	--	--	---	---

When the Discount of any Sum is at any of the Rates in the Table above, *viz.* from 2 to 10, then the opposite Numbers with the Time of Discount added to them will be proper Divisors for your intended Purpose, and are found by dividing 1200 by the Rate of Discount; according to the Rule of the third Method of Discount.

If the Discount be 20, 30, or 40 *per Cent.* then cut off a Cypher from 600, 400, 300, £c. and add the Time to 60, 30, or 40, for the Divisor, £c.

Example 9.

What is the Discount of *l.* 212-15, for 3 Months, at
40 *per Cent. per Annum*?

According to Rule, I add 3 (the Time) to 30, and it makes 33 for a Divisor, £c.

212 15
3

33)638 05 (*l.* 19-6-9 $\frac{3}{4}$ $\frac{3}{11}$ Answer.
£c.



C H A P. XVII.

E X C H A N G E,

IS the receiving of Money in one Country, or Nation, and paying it again in another, Value for Value, having respect to the several Species of Coin, or Money of each Nation.

Exchange of Coins, is like the Business of exchanging or Bartering of Goods, and depends on a clear Understanding of the *Golden Rule*, to find what Sum of one Country's Money will be equal in Value to any proposed Sum of another Country's Money: In order to which, it is very necessary to have at all times a true Account of the just Values of those Foreign Coins that are to be exchanged, as they are compar'd in Value to our *English*, at all times, as abovesaid, because the *Par* of Exchange differs almost every Day from *London* to other Countries, that is, it rises and falls, &c.

The Way of Working *Exchange* is, either by the *Rule of Three* or by *Practice*, and most commonly by the latter.

London Exchanges with *Holland*, *Flanders*, &c. upon so many Shillings, and Pence *Flemish* for the Pound Sterling; the *Par* being 33 s. 4 d. *Flem*.

Dutch Money.				Sterl. Val.	
				s.	d.
2 Groats, 1 Stiver	—	—	—	0	1 $\frac{1}{2}$
1 Stiver	—	—	—	0	7 $\frac{1}{2}$
6 Stivers, 1 Schilling <i>Flem</i> .	—	—	—	2	0
20 Stivers, 1 Guilder	—	—	—	12	0
6 Guilders, 1 Pound <i>Flem</i> . 20 s.	—	—	—	20	0
33 s. 4 d. <i>Flemish</i> , or 10 Guilders	—	—	—	3	0
A common Dollar	—	—	—	5	0
A Specie Dollar	—	—	—		

Example

Example 1.

Remitted from *London* to *Amsterdam*, a Bill of Exchange of *l. 285-10 Sterling*, the Exchange at *33 s. 9 d. Flem. per Pound Sterl.* how many *Guilders Flemish* must the Bill be drawn for? *Anf. 2890 Guilders 13 Stivers.* Work'd thus:

If *20s. Ster.* give *33s. 9d. Flem.* what *l. 285 10 Sterl.?*

12	20
405	5710
	405
	28550
	228400
	2 0)231255 0

2 Groats 1 Stiver 2)115627-10

20 Stivers, 1 Guilder 2|0)5781|3

Answer, 2890 13

When you would know your Gain, or how much the Exchange is in your Favour, subtract the *Par* from the Course, or Price of the Exchange, and the Difference is the Gain *per Pound Flemish*, as here it is but *5 d.* And so the contrary for Loss, &c.

Example 2.

A Merchant in *Rotterdam* remits a Bill of Exchange of *7621 Guilders, 7 Stivers*, to be paid in *London*, how much *Sterling Money* must the said Bill be drawn for, the Exchange at *33 s. 4 d. Flem. per Pound Sterling?*

Anfw. l. 762-2-8.

If 33 s:

Guild. Stiv.

If 33 s. 4 d. Flem. gives 20 s. Sterl. what 7621 7

12	12	20
400	240	152427
		2 Groats
		304854
		240
		12194160
		609708
		4 00)731649 60
		12)182912
		2 0)1524 2-8

Answ. l. 762-02-8

Sterling Money may be brought into *Flemish Money* by *Practice*, thus: Consider how much the Rate of Exchange is above a Pound *Sterling*, which reduce to the Parts of a Pound, and take those Parts of the *Sterling Money*, and add them to the *Sterling Money*; which Total multiply by 6, because 6 *Guilders* make a Pound *Flemish*, and the Product will be the Answer.

Example.

The Answer to the 2d Example of *Flemish Money*, reduced to *Sterling Money*, is

l. 762 2 08

254 0 10 $\frac{2}{3}$ 254 0 10 $\frac{2}{3}$

Here the Difference is 13 s. 4 d.

or $\frac{2}{3}$ of a l. wherefore I take $\frac{2}{3}$ of

l. 762-2-8, and add the Results to

it, and it makes 7621 *Guilders*, 6*Stivers*, 8 *Pennicks*, or 1 *Groat*;

as by the Rule of Three.

1270 4 05 $\frac{1}{3}$

6

Guild. 7621 6 08

Or

Or *Flemish* Money may be brought into *Sterling* Money, by bringing the Course or Rate of Exchange into Pence, for a Divisor; and the *Flemish* Money into Pence likewise, for a Dividend; and the Quotient will be the Answer, in *Sterling* Money.

Example 3.

For how much *Sterling* Money must a Bill be drawn, for Goods bought in *Holland*, amounting to 11715 *Guild.* 12 *Stivers*, the Exchange at 34 *s.* 8 *d.* *Flem.* per Pound *Sterling*.

<i>s.</i>	<i>d.</i>	<i>Guild.</i>
34	8	11715 12 <i>Stiv.</i>
12		40 <i>Groats.</i>
416	Divif.	)468624 (l. 1126 10 <i>Sterl.</i>
		(208) Remainder.
		20
		4160 (10 <i>s.</i>
		4160

London Exchanges with *France* upon the *French* Crown, whose *Par* is 54 *d.* that is, to pay so many Pence, or *Shillings* and Pence, for the *French* Crown.

<i>French Money.</i>	<i>Val. Sterl.</i>
	<i>s.</i> <i>d.</i>
12 <i>Deniers</i> 1 <i>Soulz</i>	— — 0 0 $\frac{3}{4}$, $\frac{1}{2}$
20 <i>Soulz</i> 1 <i>Livre</i>	— — 1 6
3 <i>Livres</i> 1 <i>Crown</i>	— — 4 6

Example 4.

If I draw a Bill per Exchange l. 210 17 10 *Sterling*, to be paid in *Paris*, the Exchange at 57 *d.* $\frac{1}{8}$, for how many Crowns must I draw the Bill?

Ans^w. 886 *Fr.* Cr. 0 *Liv.* 1 *Soulz.*

If

d. *Fr. Cr.* *l. s. d.*
 If 57 $\frac{1}{8}$ — 1 — what 210 17 10
 8 3 *Liv.* 20

457 3 *Liv.* 42 17
 20 *Sol.* 12

60 506 14

8 Eights

4049 12

60 Second Number.

457)24294720(53161 *Soulz*
 1 *Fr. Crown* 60 *Soulz* 6|0)5316|1

Li. Soulz

F. Cr. 886 00 1 *Answer.*

Example 5.

Admit a Bill drawn in *Lyons*, and payable in *London* for 1510 Crowns, 2 *Livres* 10 *Soulz*, how much *English* Money comes it to, the Exchange at 55 *d.* $\frac{1}{8}$?

Ans. *l.* 347-0-4 $\frac{1}{8}$.

Again, suppose a Merchant in *London* buys Goods for another in *Calais*, to the Value of *l.* 102-4 *Sterling*, for which he is to draw a Bill on him in *Calais*; for how many Crowns must the Bill be drawn, Exchange at 56 *d.* per Crown? *Ans.* 438 *Fr. Cr.*

s. *Fr. Cr.* *l. s.*

If 4 $\frac{2}{3}$ — 1 — 102 4

3 20

14

2044

Here the first and third Numbers are brought into 3 Thirds, and then 1 divide by 7 and 2, the *Ratio's* of 7)6132 14, &c.

2) 876

Ans. 438 Crowns.

London

London exchanges with Spain upon the Pieces $\frac{8}{8}$, at 54 d. Sterling.

Spanish Money.		Sterl. Val.
1 Merwid		s. 0 0 $\frac{1}{3}$, $\frac{1}{5}$
34 Merwids	1 Rial (formerly 6 d.)	0 4 $\frac{3}{4}$
11 Rials Plate	1 Ducat	4 4
10 Rials Plate	1 Piece of $\frac{8}{8}$	4 0

Example 6. How many Pcs. $\frac{8}{8}$ at 48 d. $\frac{1}{4}$, will answer a Bill of l. 344 11 8 $\frac{1}{2}$ Sterling? *Ans.* 1714.

Exam. 7. In 24690 Rials Plate, how many Pcs. $\frac{8}{8}$, and Pounds Sterling, the Exchange at 4 s. 6 d. per Pcs. $\frac{8}{8}$?

Answer, { 2469 Pcs. $\frac{8}{8}$
l. 555 10 6 Sterling.

London Exchanges with Portugal upon the Millrea, of about 5 s. 6 d. to 5 s. 7 d.

Portugal Money.		Sterl. Val.
		s. d.
12 $\frac{1}{2}$ Reas		0 1
1000 Reas	1 Millrea	6 8
1 Feftoon		1 3

Example 8. How many Millreas, must a Bill be drawn for, to pay l. 125 11 11 $\frac{3}{4}$ Ster. the Exchange at 5 s. 6 d. $\frac{1}{4}$ per Millrea? *Ans.* 455 Millreas.

If 5 s. 6 d. $\frac{1}{4}$ ——— 1 what l. 125 11 11 $\frac{3}{4}$?
Ans. 455.

Example 9. How many Pounds Sterling, &c. must a Bill be drawn for, to answer 500 Millreas, the Exchange at 5 s. 5 d. $\frac{5}{8}$ per Millrea? *Ans.* 136 14 4 $\frac{1}{2}$

Example 10. How many Pounds Sterling, &c. must a Bill be drawn for, to answer 600 Millreas, 550 Reas, at 5 s. 7 d. per Millrea? *Ans.* l. 167-13 0 $\frac{3}{4}$

London

London Exchanges with *Venice* upon the *Ducat* of 52 d.
and with *Leghorn* upon the *Dollar*, or *Piece* of $\frac{8}{9}$ of 54 d.

	Italian Money.	Sterl. Val.
1 <i>Livre</i> at <i>Leghorn</i>	_____	s. 0 9
1 <i>Crown</i> current at <i>Florence</i>	_____	s. 5 3
1 <i>Ducat de Banco</i> at <i>Venice</i>	_____	4. 4
1 <i>St. Mark</i> at ditto	_____	2 10
1 <i>Palermo Florin</i>	_____	2 6

When a Comparison is made between *Foreign Coins* of one Country and another, such Questions may be answered by the *Single Rule of Three Inverse*.

Example 11.

How many *Spanish Ducats*, at 4 s. 4 d. must be drawn for 700 *Rix Dollars*, at 5 s. 6 d.

If 700. — 5 s. 6 d. — 4 s. 4 d?

12

12

66

52

700

52)46200(888 $\frac{2}{3}$ Answ.

416

460

416

440

416

(24)

C H A P. XVIII.

P R O F I T and L O S S.

Example 1.

IF I buy 220 Yards of *Broad Cloth*, at 8 s. 6 d. *per* Yard, and sell it again at 10 s. 4 d. *per* Yard, what do I gain by the whole?

First find the Difference by *Subtraction*, between the Price bought, and the Price sold for; then by *Practice* cast up the Number of Yards, by that Difference, as underneath.

s.	d.	
10	4	Sold for
8	6	Bought for

1 10 Difference.

220 Yards at 1 s. 10 d.			Or thus:
6 d.	$\frac{1}{2}$	110	220
4 d.	$\frac{1}{3}$	73 4	
20 3 4			22
			Subtract $\frac{1}{120}$ 1 16 8

Answer, *l.* 20 3 4 Total Gain.

l. 20 03 4

Example 2. If a Draper buy 750 Ells of *Holland*, for *l.* 81-5, how must it be sold *per* Ell, to gain *l.* 21 17 6 in the whole? *Ans.* 2 s. 9 d.

Here the intended Gain must be added to the Prime-cost, which makes *l.* 103 2 6. Then say,

If 750 Ells cost *l.* 103 2 6, what 1 Ell? And the Answer will be 2 s. 9 d. *per* Ell. And for so much must he sell it *per* Ell, to gain *l.* 21 17 6 in the Whole.

And

And for the Proof, see by *Practice* what 750 Ells come to, at 2 s. 9 d. and you will find it amount to l. 103-2-6.

Example 3. Admit a Merchant to buy Goods to the Value of 425 l. and offers them again for l. 15 per Cent. Profit, what come they to? State it thus:

If l. 100 gain l. 15 what l. 425	115
Or thus:	
425 at 15 per Cent.	2125
4 Hundred under 15 per Cent.	425
	425
l. 60	
25 is $\frac{1}{4}$ of 3 15, or $\frac{1}{4}$ of 15 l.	488 75
100 l.	20
l. 63 15 Profit.	
Add 425 00 Prime Cost.	15 00
	Answ. l. 488-15
Answ. l. 488 15 What they must be sold for, as before.	

Example 4. If I buy 500 Pair of Silk Hose, at 8 s. 6 d. per Pair, how much must I sell them for per Pair, to gain 30 per Cent. Profit?

First see what they come to at 8 s. 6 d. per Pair thus:

500 Pair at 8 s. 6 d.
8
4000
6 d. $\frac{1}{2}$ 250
425 0
Answ. l. 212-10

Then

Then see what *l.* 212 10 comes to at 30 *per Cent.*
10 *per Cent.*

$$\begin{array}{r}
 21 \overline{) 25 \ 00} \\
 \underline{20} \\
 5 \overline{) 00}
 \end{array}
 \qquad
 \begin{array}{r}
 \textit{l.} \ 21 \ 5 \ 10 \textit{ per Cent.} \\
 \underline{3} \\
 \textit{l.} \ 216 \ 05
 \end{array}$$

30 *per Ct.* Profit *l.* 63 15 } *Answ.*
Prime Cost, 212 10 } *added.*

Then say, If 500 Pair cost *l.* 276-5, what one Pair?
Answ. 11 *s.* 0 *d.* $\frac{3}{5}$

Example 5. An Half-penny in the Shilling, what is that *per Cent.*

$$\begin{array}{r}
 \textit{l.} \ 100 \\
 \underline{20} \\
 \frac{1}{2} \overline{) 2000} \text{ Shillings} \\
 \underline{12 \overline{) 1000}} \\
 8 \overline{) 3 \ 4}
 \end{array}
 \qquad
 \begin{array}{r}
 \textit{Or thus.} \\
 4 \overline{) 100} \\
 \underline{6 \overline{) 25}} \\
 \textit{l.} \ 4 \ 3 \ 4
 \end{array}$$

Answ. 4-3-4 *per Cent.*

A Penny in the Shilling is as much again; 2 *d.* four times as much, 3 *d.* six times as much, &c. So you may multiply it either by 2, 4 or 6, to know how much you gain *per Cent.* at those Rates in a Shilling, &c. Or consider what part of a Shilling your profit is, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, or $\frac{1}{5}$, &c. and take that Part of a 100 *l.* and the Quotient will be what such Profit in a Shilling makes *per Cent.*

Example 6. As supposing 2 *d.* in the Shilling be your Profit. Two-pence we know is the $\frac{1}{6}$ th of a Shilling, wherefore I take the 6th Part of 100 *l.* thus:

$$6 \overline{) 100}$$

$$6)100 \text{ l.}$$

Answ. 16 13 4 *per Cent.*

In the last Example, $\frac{1}{2}d.$ in the Shilling was *l. 4 3 4 per Cent.* where, if you multiply by four, the Halfpence in 2 *d.* you'll find the same Answer *l. 16 13 4* Proof. And so the contrary.

Again, Admit I gain 3 *d.* $\frac{1}{2}$, or 5 *d.* in the Shilling, what is that *per Cent*?

Here in regard 3 *d.* $\frac{1}{2}$ is $\frac{7}{8}$ and 5 *d.* $\frac{1}{2}$ of a Shilling, I multiply 100 by the Numerator, and divide by the Denominator, according to the 4th Table at the beginning of the Rule of *Practice*; thus:

100	100	
3 <i>d.</i> $\frac{1}{2}$ in the 1 <i>s.</i>	7 Halfpence	5 Pence in the 1 <i>s.</i>
4)700	12)500	(<i>i. e.</i> $\frac{5}{12}$)
6)175	1. 41 $\frac{8}{12}$ or $\frac{2}{3}$, <i>i. e.</i> 13 <i>s.</i> 4 <i>d.</i>	

Answ. *l.* 29 $\frac{1}{8}$, or 3 *s.* 4 *d.*

As whatever Part of a Shilling is your Profit, the same *per Cent.* will be your Profit also: so on the Contrary, whatever Part of 100 *l.* is your Profit, the same Part of a Shilling will be your Profit likewise. As suppose your Gain be 25 *per Cent.* which is the 4th Part of 100 *l.* so your Gain in a Shilling will be 3 *d.* at the Rate of 25 *per Cent.* for as 25 is the 4th of 100, so is 3 *d.* of 12 *d.*

Example 7. If I propose to get on any Goods 20 *l.* *per Cent.* Profit, what is that in a Shilling? 20 *l.* is the 5th part of a 100 *l.* wherefore take the 5th Part of a Shilling for the Profit thus:

$$5)12 \text{ d.}$$

$$2\frac{1}{4}\frac{3}{5}$$

Example

Example 8. Suppose I have goods to the Value of $l. 415\ 12\ 6$, that come to a bad Market, and know that they impair by lying, I therefore am obliged to sell them at *12 per Cent. Loss*, what come they to?

Here the Loss must be subtracted from $100\ l.$ and the Remainder is the middle Number.

From $l. 100$ If $100\ l. - 88\ l.$ what $l. 415\ 12\ 6$
take 12 *Ans.* $365\ 15\ 0$

88

Lost in all, $l. 49\ 17\ 6$

Or thus: See what $l. 415\ 12\ 6$ comes to at *12 per Ct.* and subtract that from the Cost of the Goods.

$l. 415\ 12\ 6$
 12

$l. 49\ 87\ 10\ 0$
 20

$s. 17\ 50$
 12

$d. 6\ 00$

From $l. 415\ 12\ 6$
take $49\ 17\ 6$

Ans. $l. 365\ 15\ 0$

If Deal Boards be bought at $18\ d.$ per Piece, and sold again at $21\ d.$ what is that *per Cent. Profit*?

Answer, l. 16 13 4, thus:

If $18\ d.$ gain $3\ d.$ what $100\ l.$

If I buy Cinnamon for $6\ s. 7\ d.$ per lb. and sell it again for $5\ s. 9\ d.$ what is lost *per Cent.*

Ans. $l. 12\ 13\ 1\ \frac{7}{8}$.

If $6\ s. 7\ d.$ lose $10\ d.$ what $100\ l.$

There are two or three other Rules which might be introduced, such as *Alligation, Medial* and *Alternate*; and the *Rule of False*; but they being more for Amusement than real Use, I shall omit them, and, in the next Place, say something of *Fractions*.



C H A P. XIX.

Of F R A C T I O N S,
Vulgar and Decimal.

N U M E R A T I O N.

I. **A** *Fraction* is part of a whole Number, and arises from *Division*, (as was said before) and hath these two Parts, viz. *Numerator* and *Denominator*, which have a short line between them, and set thus:

Remainder 5 Numerator.

Divisor 8 Denominator.

The Numerator expresses the Number of Parts, and the Denominator giveth to those Parts their Names. As suppose 277 *l.* be divided among 8 Men, the Quotient will be 34 *l.* the share to each Man; and there will be a Remainder of 5, which must be set over the *Divisor* 8 thus $\frac{5}{8}$; and signifies that if 1 *l.* or 20 *s.* were divided into 8 Parts, each Man must have 5 of those 8 Parts, (or $\frac{1}{2}$ Crowns) more to his Share, as was before hinted.

II. A *Vulgar Fraction* is either *Simple* or *Compound*.

III. A *Simple Vulgar Fraction* is that which hath only one Numerator and one Denominator, and is either *Proper* or *Improper*.

IV. A *proper Fraction* hath always its Denominator greater than its Numerator, as $\frac{3}{4}$, $\frac{7}{8}$, $\frac{1}{21}$, &c.

V. An *Improper Fraction* hath its Denominator always less than its Numerator, as $\frac{5}{2}$, $\frac{9}{3}$, $\frac{30}{12}$, &c.

VI. *Compound Fractions* consist of divers Numerators and Denominators, and are known by this Particle [*of*] being between them; and are therefore sometimes called

called Fractions of Fractions ; as $\frac{2}{3}$ of $\frac{5}{6}$ of $\frac{7}{8}$ that is, two thirds of five sixths of seven eights.

VII. Fractions are of two Kinds, *Vulgar* and *Decimal*.

What *Vulgar* Fractions are, hath been declared already. A *Decimal* Fraction is an artificial Way of expressing *Vulgar* Fractions, by setting down the Numerators only ; the Denominators being understood, but not expressed ; and is always an Unit, with as many Cyphers annexed as there are Places in the Numerator, and therefore must be either 10, 100, 1000, 10000, 100000, &c.

VIII. A *Decimal* Fraction is distinguished from a whole Number, by a *Comma*, or Point prefix'd thus, ,5 and signifies 5 tenths of an Integer. So the following Fractions are exhibited vulgarly and decimally, viz.

	Vulgarly.	Decimally.
7 Tenths	$\frac{7}{10}$	,7
35 Hundredths,	$\frac{35}{100}$	,35
327 Thousandths,	$\frac{327}{1000}$	,327
64 Ten Thousandths,	$\frac{64}{10000}$	,0064
108 Hundred Thouf.	$\frac{108}{100000}$	,00108

In Decimals $\frac{1}{4}$ of any thing is ,25 ; $\frac{1}{2}$ of *ditto*, is ,5 : $\frac{3}{4}$ is ,75.

IX. As whole Numbers increase by a Ten-fold Proportion from the Units Place, to the Left Hand ; so Decimals decrease by the same Proportion, from Unity to the Right Hand, as may be seen by the following Table.

Integers.

Integers.							Decimals.						
Millions	C. of Thousands	X's of Thousands	Thousands	Hundreds	Tens		Tenth Parts	Hundredths	Thousandths	X. Thousandths	C. Thousandths	Millions of Parts	
7	6	5	4	3	2		1	2	3	4	5	6	7
							Units.						
Seventh Place	Sixth Place	Fifth Place	Fourth Place	Third Place	Second Place		Primes	Seconds	Thirds	Fourths	Fifths	Sixths	

Integers, or whole increasing Numbers.

Decimals, or Fractional decreasing Numbers.

Here the Figure 2 in the Integers signifies 2 Tens, or twice 10 Units; but the Figure 2 in the Decimals, signifies but 2, or 2 Tenths of Unity, or one.

X. The Order of Places in whole Numbers is from the Right Hand to the Left; but in Decimals it is from the Left Hand to the Right. So in this Decimal ,456, the Figure 4 stands in the first Place, and is 4 *Primes*, or 4 Tenths of an Integer; and 5, the second Figure, is 5 Seconds, or Five hundredth Parts of an Integer, &c.

XI. Cyphers before Integers, and after Decimals, are of no Value; but after Integers, and before Decimals, they have their Value: For in Integers they increase, and in Decimals they decrease the Value of the Figure join'd with them. For 4, and 04, and 004, in whole Numbers, is still but four; but in Decimals, 4, by having a Point prefix'd, thus, ,4 is decreased from 4 Integers to $\frac{4}{10}$ of an Integer, and ,04 to 4 hundredth Parts of an Integer, &c. Again in whole Numbers, 30 is Thirty, and 300 is three hundred; but in Decimals, ,30 or ,300 is still but $\frac{3}{10}$ of an Integer.

Reduction

Reduction of Fractions, is to bring a Fraction into a common, or into the least Denomination; thereby preparing Fractions to be added, subtracted, multiplied or divided.

XII. To reduce Fractions that have unequal Denominators, to Fractions of one common Denominator.

The Rule.

Multiply each Numerator into all the Denominators, (except its own) and take the respective Products for new Numerators. 2dly, Multiply all the Denominators continually; so shall that Product be a new Denominator, common to all the Numerators found before.

Example.

Reduce $\frac{2}{5}$, $\frac{3}{7}$ and $\frac{8}{9}$ of a Pound to a common Denominator.

The first 2 the 2d 3 the 3d 8 Denominator.

$\begin{array}{r} 7 \\ \hline 14 \\ 9 \end{array}$	$\begin{array}{r} 5 \\ \hline 15 \\ 9 \end{array}$	$\begin{array}{r} 7 \\ \hline 56 \\ 5 \end{array}$	$\begin{array}{r} 5 \\ \hline 7 \\ 35 \\ 9 \end{array}$
$\frac{2}{5} \left\{ \begin{array}{l} 126 \\ \hline 315 \end{array} \right.$	$\frac{3}{7} \left\{ \begin{array}{l} 135 \\ \hline 315 \end{array} \right.$	$\frac{8}{9} \left\{ \begin{array}{l} 280 \\ \hline 315 \end{array} \right.$	$\frac{315}{315} \text{ Com. Denominator.}$

Here I first multiply 2 by 7, and the Product is 14, which I multiply by 9, and the Result is 126, for the first Numerator. Again, I multiply 3 by 5, and the Product is 15, which multiplied by 9, makes 135, for the second Numerator: Then I multiply 8 by 7, and the Product is 56, which multiplied by 5 produces 280, for the last Numerator. Last of all, I multiply 5, 7, and 9, the several Denominators together, and their Product is 315, for the common Denominator, to all the Fractions, *See the Work above.*

N

Reduce

$$\begin{array}{lcl}
 \text{Reduce } \frac{1}{2}, \text{ and } \frac{5}{8} & \frac{8}{16} & \frac{10}{16} \\
 \text{Reduce } \frac{1}{7}, \text{ and } \frac{1}{12} & \frac{4}{28} & \frac{1}{12} \\
 \text{Reduce } \frac{3}{7}, \text{ and } \frac{5}{9} & \frac{5}{14} & \frac{5}{9}
 \end{array} \left. \vphantom{\begin{array}{l} \frac{8}{16} \\ \frac{4}{28} \\ \frac{5}{14} \end{array}} \right\} \text{Facit.}$$

To prove your Work, divide the new Numerator by the Numerator of the Fraction; and also divide the common Denominator by the Denominator of the Fraction, and if both Quotients are alike, the Work is right.

XIII. *Abbreviation*, or how to bring a Fraction into its lowest Denomination.

The Rule.

Divide both Numerator and Denominator by such a Number as will leave no Remainder in either of them. When the Numerator and Denominator are both even Numbers, they may be reduced by halving, or dividing them by 2.

Example. Reduce $\frac{12}{28}$ into its lowest Terms, or Denomination.

$${}^2 \left\{ \begin{array}{c|c|c} 12 & 6 & 3 \\ \hline 28 & 14 & 7 \end{array} \right. \text{ Answer } \frac{3}{7}$$

Here I say the $\frac{1}{2}$ of 12 is 6, and $\frac{1}{2}$ of 28 is 14; and then again the $\frac{1}{2}$ of 6 is 3, and the $\frac{1}{2}$ of 14 is 7: So is the Fraction $\frac{12}{28}$ reduced to $\frac{3}{7}$ its lowest Terms; and $\frac{3}{7}$ of any thing is equal in Value to $\frac{12}{28}$. Or if you had divided the said Fraction by 4, it had been reduced at once; for the 4's in 12, is 3 times, and the 4's in 28, 7 times, or $\frac{3}{7}$ as before.

When you can no longer halve the Fractions, then divide it either by 3, 4, 5, 6, 7, &c. if any of them so divide as to leave no Remainder. And after you have divided by a greater, you may after divide by a lesser Number, to reduce the Fraction lower still.

Example.

Example. Reduce $\frac{84}{168}$ into its lowest Denomination.

$$\frac{1}{2} \left\{ \begin{array}{c} \text{by} \quad \text{by} \quad \text{by} \\ 84 \mid 2 \mid 42 \mid 7 \mid 21 \mid 3 \mid 3 \mid 1 \\ \hline 168 \mid 2 \mid 84 \mid 7 \mid 42 \mid 3 \mid 6 \mid 2 \end{array} \right\} \text{Answ. } \frac{1}{2}$$

Here I first take the $\frac{1}{2}$, or divide it by 2, and then by 2 again; and then by 7, and then by 3, which brings the Fraction into $\frac{1}{2}$, its lowest Terms.

(3.) If the Fraction, *viz.* Numerator and Denominator end each with a Figure of 5, or a Cypher, or the one with a 5, and the other with a Cypher, divide each of them by 5, and the Quotient will be a new Numerator and Denominator.

Example. Reduce $\frac{55}{80}$, and $\frac{11}{16}$, into their lowest Terms.

$$5 \left\{ \frac{55}{80} \mid \frac{11}{16} \right\} \text{Answer, } \frac{11}{16}$$

$$5 \left\{ \frac{75}{95} \mid \frac{15}{19} \right\} \text{Answer, } \frac{15}{19}$$

(4.) There is a Way of reducing a Fraction into its lowest Name by a common Measure, which is thus:

Divide the *Denominator* by the *Numerator*, and if any thing remain, divide your last *Divisor* thereby, and if any thing yet remains, divide the foregoing *Divisor* by it; and so you must do till nothing remains, then the last *Divisor* is the common Measure required, which will divide both *Numerator* and *Denominator*, without leaving any *Remainder*; and so reduce the Fraction into its lowest Terms at once. But if your last *Divisor* be 1, the Fraction is in its lowest Name already.

Example. Reduce $\frac{128}{144}$ into its lowest Terms, by a common Measure.

$$\begin{array}{r} 128)144(1 \\ \underline{128} \end{array}$$

$$\begin{array}{r} 16)128(8 \\ \underline{128} \\ (0) \end{array}$$

$$\begin{array}{r} 16)128(8 \\ \underline{128} \end{array}$$

$$\begin{array}{r} (0) \\ 16)144(9 \\ \underline{144} \\ (0) \end{array}$$

Here I first divide 144 by 128, and there remains 16; by which I divide the last Divisor 128, and there remains (0), wherefore 16, the last Divisor, is the common Measure sought for, and doth divide both Numerator and Denominator, and leaves no Remainder, (as may be seen in the Work above) and reduces the Fraction into $\frac{8}{9}$, its lowest Terms.

But I prefer the other Way, in common Business, before this latter; for the Time spent in finding the common Measure, is longer than that spent in reducing the Fraction the other Way.

It is very expeditious in many Cases to work Fractionally, viz. to multiply by the Numerator and divide by the Denominator of a Fraction in its lowest Terms.

Example. What comes a hundred Weight to at 6d. $\frac{1}{2}$ per Pound? Consider that $\frac{112}{240}$, in its lowest Terms, is $\frac{7}{15}$, wherefore multiply 6d. $\frac{1}{2}$ by 7, and divide by 15, thus:

$$\begin{array}{r} 6d. \frac{1}{2} \\ \underline{7} \end{array}$$

$$3)45 \frac{1}{2} \text{ Rem. } \frac{2}{3}, \text{ or } 8d.$$

$$5)15$$

Ans^w. l. 3-0-8 per C.

Or

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Or if you double the Price of a Pound, and multiply by 7 and 8, as follows, you have the Answer.

$$\begin{array}{r}
 6d. \frac{1}{2} \\
 \hline
 s. \quad 1 \quad 1 \\
 \quad \quad 7 \\
 \hline
 \quad \quad 7 \quad 7 \\
 \quad \quad \quad 8 \\
 \hline
 \text{Answ. l. } 3 \quad 0 \quad 8
 \end{array}$$

Or contrariwise, you have the Price of a Pound thus:

$$\begin{array}{r}
 7)60s. \quad 8d. \\
 \hline
 8) \quad 8 \quad 8 \\
 \hline
 2) \quad 1 \quad 1 \\
 \hline
 6d. \frac{1}{2} \text{ Answer.}
 \end{array}$$

Any Goods sold by the Long Hundred in Tale, or 120 to the Hundred, as *Linen, Fish, Deals, &c.* being $\frac{120}{240}$, multiply the Price of one by 6, and divide that Product by 12, thus:

Example. Fish at 3d. $\frac{1}{2}$ a Piece.

$$\begin{array}{r}
 6 \\
 \hline
 12)21
 \end{array}$$

Anf. l. 1 $\frac{9}{2}$ or 15 s.

When things are sold by the 1000, as *Bricks, Tyles, Hoops, &c.* standing thus. $\frac{1000}{240}$, then multiply the Price of one by 50, and divide by 12, it gives the Price of 1000.

N 3

Example.

Example. Oranges at 2 d. a Piece

$$\begin{array}{r} 50 \\ \hline 12 \overline{)100} \end{array}$$

Ans. l. 8 $\frac{4}{12}$ or 6 s. 8 d. per Thouſ.

$$\begin{array}{r} 12 \\ \hline 50 \overline{)100 \ 0 \ 0} \end{array} \left. \begin{array}{l} \\ \\ \end{array} \right\} \text{contrary.}$$

2 d. a Piece

Or any thing ſold by the 1000, may be done by multiplying the Quantity by the Price, always cutting off 3 Figures, or Cyphers, towards the Right Hand.

Exam^{le}. Bought 4796 plain Tiles, at 17 s. 6 d. per M.

$$\begin{array}{r} 17 \\ \hline 81532 \\ 6 d. \text{ is } \frac{1}{2} \text{ of } 1 s. \quad 2398 \\ \hline 83 \overline{)930} \\ 12 \\ \hline 4 \overline{)311} \overline{)160} \end{array}$$

Ans. l. 4-3-11 $\frac{168}{1000}$

This is an eaſy and plain Method.

Again, Sold 45874 Grey Stock Bricks, at 18 s. per M.

$$\begin{array}{r} 18 \\ \hline 825 \overline{)732} \\ 12 \\ \hline l. \ 41-5-8 \overline{)784} \\ 4 \\ \hline 3,136 \end{array}$$

I multiply by 18, and it produces 825 s. and 732 cut off for 1000, and that multiply'd by 12, gives 8 d. &c.

Ans. l. 41-5-8 $\frac{136}{1000}$

A.

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A Fraction is seldom abbreviated in Decimals.

XIV. *Valuation.* The Value of a Fraction is found by multiplying the *Integer* by the *Numerator* of the Fraction, and dividing that Product by the *Denominator*. Or contrariwise, by dividing by the *Denominator*, and multiplying by the *Numerator*.

Example. What is the $\frac{2}{3}$ of a *l. Sterling*?

20 s. the Integer.

2 Numerator

$$\begin{array}{r} \text{---} \\ 3)40 \\ \text{---} \end{array}$$

s. 13 4 Answ.

Contra. 3)20

$$\begin{array}{r} \text{---} \\ 3)20 \\ \text{---} \end{array}$$

s. 13 4 Answ.

What is the $\frac{4}{5}$ of a *Pound*?

20 s.

$$\begin{array}{r} 4 \\ \text{---} \\ 5)80 \\ \text{---} \end{array}$$

16 Answ.

What is $\frac{12}{8}$ of 20 s.

$\frac{3}{2}$ its lowest Terms.

$$\begin{array}{r} \text{---} \\ 7)60 \\ \text{---} \end{array}$$

s. 8 $\frac{4}{7}$ Answer

What is $\frac{3}{7}$ of a *C. Weight*?

112 lb. the Integer.

Contra. 7)112

$$\begin{array}{r} 3 \\ \text{---} \\ 7)336 \\ \text{---} \end{array}$$

48 lb. Answer

$$\begin{array}{r} \text{---} \\ 16 \\ \text{---} \\ 3 \\ \text{---} \end{array}$$

48 lb. Answer

N 4

What

What is	{	$\frac{6}{7}$ of a <i>l</i> ?	Answer, 17 s. 1 d. $\frac{1}{2}$ $\frac{6}{7}$
		of a Shilling?	Ans. 10 d. $\frac{1}{2}$
		of a <i>l</i> . 100 <i>Sterling</i> ?	Ans. 75 <i>l</i> .
		of a Tun of Wine?	Ans. 176 $\frac{4}{10}$ Gal.
		of a C. Weight?	Ans. 71 $\frac{3}{11}$ lb.
		of a Gallon?	Ans. 3 $\frac{2}{10}$ Pints
		of a Tun Weight?	Ans. 15 C.
		of a Foot?	Ans. 8 Inches
		of a lb. Weight?	Ans. 12 oz.

*Mix'd Numbers.*What is $\frac{4}{6}$ of 12 s. 6 d?

Contra. 6)12 s. 6 d.

$$\begin{array}{r}
 4 \\
 \hline
 6)50 \ 0 \\
 \hline
 8 \ 4
 \end{array}$$

$$\begin{array}{r}
 2 \ 1 \\
 \hline
 4 \\
 \hline
 8 \ 4
 \end{array}$$

If a Yard of Cloth be worth 8 s. 10 d. what $\frac{3}{4}$?

$$\begin{array}{r}
 3 \\
 \hline
 4)26 \ 6 \\
 \hline
 6 \ 7 \frac{1}{2} \text{ Ans.}
 \end{array}$$

If a Ship be worth *l*. 946 12 6, what $\frac{4}{32}$ Parts?

$$\begin{array}{r}
 4 \\
 \hline
 8)3786 \ 10 \ 0 \\
 \hline
 4)473 \ 06 \ 3 \\
 \hline
 \textit{l. 118 06 6} \frac{3}{4} \text{ Ans.}
 \end{array}$$

XV. If you would know what Part of a Pound any Number of Shillings and Pence is, or what Part of a Tun any Quantity of C. qrs. and lb. is, bring them in-
to

into the lowest Name mentioned; and also bring the Integer into the same Name, and set it for a Denominator; and then bring the Fraction into its lowest Terms.

Example. What Part of a Pound is 12 s. 6d?

$$\begin{array}{r}
 20 \text{ s. the Integer} \quad 12 \\
 12 \\
 \hline
 240
 \end{array}
 \begin{array}{r}
 \text{Numerator, } 15|0 \\
 \hline
 \text{Denominator, } 24|0
 \end{array}
 \left. \vphantom{\begin{array}{r} 12 \\ 240 \end{array}} \right\} \text{Answer.}$$

When there are Cyphers in a Vulgar Fraction at the End, they may be cut off, and you work as if there were none; as in the foregoing Example.

What Part of C. Wt. is 71 lb. $\frac{3}{4}$?

$$\begin{array}{r}
 11 \\
 \hline
 784 \\
 \hline
 1232
 \end{array}
 \begin{array}{r}
 112 \text{ lb. the Integer.} \\
 11 \\
 \hline
 1232
 \end{array}$$

Answer, $\frac{784}{1232}$, or $\frac{7}{11}$ in its lowest Terms.

XVI. *To reduce Vulgar Fractions into Decimals.* Reduction of Decimals is either from common Fractions, or into some known Denomination. Therefore to reduce any Vulgar Fraction into a Decimal, to the Numerator of the Fraction, annex 1, 2, 3, 4, 5, or more Cyphers at Pleasure, and then divide by the Denominator.

Example. Reduce $\frac{3}{4}$ of a l. into a Decimal Fraction.

$$\begin{array}{r}
 4)300 \\
 \hline
 ,75 \text{ Facit, or } 15 \text{ s}
 \end{array}$$

Here, to the Numerator 3, I annex two Cyphers, and divide by the Denominator, and it quotes ,75; which is equal in Value to $\frac{3}{4}$ of any thing.

If I had annexed 3 Cyphers to the Numerator, the Quotient would then have been ,750, which is still but ,75; for Cyphers on the Right Hand do not increase or diminish a Decimal, as was said before. Again,

N 5 Reduce

Reduce $\frac{2}{3}$ of a *l.* into a Decimal.

$$\begin{array}{r} 3 \overline{)2000} \end{array}$$

,666 *facit*, or 13 *s.* 4 *d.*

Reduce 6 *s.* 8 *d.* into a Decimal.

$$\begin{array}{r} 12 \\ \hline 8 \overline{)0}2 \\ \hline 24 \overline{)0}6 \end{array}$$

$$\begin{array}{r} 6 \overline{)2000} \end{array}$$

,333 *facit*, or 6 *s.* 8 *d.*

XVII. Valuation of Decimals. In Money you must account for every *Prime*, or *Unit*, in the first Place, 2 Shillings; and for every 5 in the second Place, 1 Shilling, and what is above 5, account so many Tens; and the Figure in the third Place, so many Units; which Tens and Units are Farthings; but if they exceed $\frac{2}{4}$, there must be one Farthing abated.

Example. What is the Value of ,75 *l.* the first of the foregoing Examples? *Ans.* 15 *s.* For the 7 in the first Place, I reckon 14 *s.* and for 5 in the second, I account 1 *s.* which put together, make 15 *s.* the Value of the *Decimal Fraction*.

Again, Another *Example* is, ,333: For the first 3 I reckon 6*s.* and for the other two I account 33 Farthings, and abating 1, (because above 25) there rests 32, or 8 *d.*

What is the Value of ,9749? The first Figure 9 being doubled, makes 18 *s.* and the Figure (7) in the second being above 5, I reckon 1 *s.* which put to the 18, makes 19 *s.* and the Excess of 7 above 5 being 2, or 2 Tens, makes the next Figure 4 to be 24, which is 24 Farthings, or six Pence. So the *Decimal Fraction* ,9749 is in Value 19 *s.* 6 *d.* A *decisive Rule.* As often above 13 makes less by 1, or above 39 makes less by 2.

When you would know the Value of a Decimal in Weight, Measure, &c. (as the Value of Decimals in Money may also be found) multiply the Decimal by the Parts of the next inferior Denomination, which makes an Integer

ger in the same Denomination with the given Decimal; and cut off so many Figures towards the Left Hand, as there are Places in the Decimal, and the Figures on the other side of the Stroke towards the Left Hand, are the Value of the Decimal, in the next inferior Denomination. And if there be any thing remaining, multiply it by the Parts of the next lower Denomination, &c. And so the Fraction may be reduced as low as you please.

Example. What is the Value of this Decimal of a C. Weight, viz. .875 Answer $\frac{3}{4}$ 14 lb,
4 qrs. 1 C.

$$\begin{array}{r} 3 \overline{) 500} \\ 28 \text{ lb. } 1 \text{ qr.} \end{array}$$

$$\begin{array}{r} 4000 \\ 1000 \end{array}$$

$$14 \overline{) 000}$$

Here three Places are cut off towards the Left Hand, because there are so many in the Decimal. And thus may the Value of any Decimal be found, whether of Money, Weight, Measure, Time, &c.

XIX. To reduce compound Fractions into simple ones of the same Value.

Rule. Multiply all the Numerators continually for a Numerator, and all the Denominators for a Denominator.

Ex. Reduce $\frac{3}{4}$ of $\frac{5}{6}$ of $\frac{7}{8}$ of a *l.* into a simple Fraction.

$$\begin{array}{r} 3 \\ 5 \\ \hline 15 \\ 7 \end{array} \qquad \begin{array}{r} 4 \\ 6 \\ \hline 24 \\ 8 \end{array}$$

Numerator 105

192 Denominator.

Denominat. 192 *Facit.*

Reduce $\frac{9}{10}$ of $\frac{1}{2}$ of $\frac{1}{4}$ of a Tun. $\frac{1^2 8^8 7}{16000}$. Anf.

XX.

XX. To reduce whole or mix'd Numbers into improper Fractions. *Rule.*

(1) If a whole Number is to be reduced into an improper Fraction, set the propos'd whole Number for the Numerator, and an Unit, or 1, for the Denominator. Thus 8 Integers may be reduced to $\frac{8}{1}$; or else you may assign a Denominator to the Integer, and multiply it by the assigned Denominator, and the Product will be the Numerator to the said Denominator.

Example. Admit 9 Integers are to be reduced into an improper Fraction whose Denominator shall be 5: Here I multiply 9 by 5, the propos'd Denominator, and the Product is 45, for a Numerator to the said Denominator 5; so is the improper Fraction, $\frac{45}{5}$ equal to 9 Integers.

Reduce 24 into an improper Fraction, whose Denominator shall be 8.

$$\begin{array}{r} 24 \\ 8 \\ \hline 192 \end{array} \left. \vphantom{\begin{array}{r} 24 \\ 8 \\ \hline 192 \end{array}} \right\} \text{Facit.}$$

(2) If a mixt Number is to be reduced into an improper Fraction. *Rule.*

Multiply the whole Number by the Denominator of the Fraction, and take in the Numerator.

Ex. Reduce $12 \frac{3}{4}$ Yards into an improper Fraction.

$$\begin{array}{r} 4 \\ \hline 51 \end{array} \left. \vphantom{\begin{array}{r} 4 \\ \hline 51 \end{array}} \right\} \text{Facit, equal to } 12 \frac{3}{4}$$

Again, Reduce $l. 14 \frac{7}{8}$ or $l. 14-17-6$ to an improper Fraction.

$$\begin{array}{r} 119 \\ 8 \\ \hline \end{array} \left. \vphantom{\begin{array}{r} 119 \\ 8 \\ \hline \end{array}} \right\} \text{Facit.}$$

XXI. To reduce improper Fractions into whole or mixt Numbers. *Rule.*

Divide the *Numerator* by the *Denominator*, and if it be a mixt Number, what was taken in will remain.

Example. Reduce $1\frac{19}{8}$ (the foregoing Sum) into its equivalent mixt Number.

$$\begin{array}{r} 8 \overline{)119} \end{array}$$

$14\frac{7}{8}$ *Ans.* Or *l.* 14-17-6

Here the Answer is 14 Integers, and $\frac{7}{8}$ of an Integer.

Reduce $5\frac{1}{4}$ Yards into a mixt Number.

$$\begin{array}{r} 4 \overline{)51} \end{array}$$

$12\frac{3}{4}$ Yards *Ans.*

Reduce $4\frac{5}{9}$ into its equivalent whole Number.

$$\begin{array}{r} 5 \overline{)45} \end{array}$$

9 *Ans.* 9 Integ.

XXII. To reduce Fractions from one *Denomination* to another.

(1) This is either a smaller Fraction to be brought into the *Denomination* of a greater; Or,

(2) A greater into a smaller.

Example. Reduce $3d. \frac{1}{2}$ into the Fraction of a *l. Sterl.* Make of it a compound Fraction, thus: Reduce the mixt Number into an improper Fraction, thus, $3d. \frac{1}{2}$, then say, what is $\frac{7}{8}$ of $\frac{1}{17}$ of $\frac{1}{20}$, of a *l.*

Ans. $\frac{7}{480}$. Or you may say, what is $\frac{7}{8}$ of $\frac{1}{48}$?

Ans. $\frac{7}{480}$.

Here it being reduced from a compound Fraction, to a simple one, according to the 19th Rule of this Chapter, it produces $\frac{7}{480}$, the proper Fraction of a *l.* belonging to $3d. \frac{1}{2}$.

Re-

Reduce $\frac{3}{4}$ of a Penny to the proper Fraction of a *l.* Say $\frac{3}{4}$ of $\frac{1}{20}$ of $\frac{1}{12}$. Or $\frac{3}{4}$ of $\frac{1}{240}$. *Ans.* $\frac{3}{960}$.

By the same Method may be reduced either Weight or Measure, &c.

When the Fraction is to be brought from a greater to a lesser Name, then multiply the Numerator by the Parts in the several Denominations, betwixt that and it, that you would reduce it to.

As suppose the Reverse of the last Question was ask'd, *viz.*

What Part of a Penny is the $\frac{3}{960}$ of a *l.*

$$\begin{array}{r} 3 \\ 20 \\ \hline 60 \\ 12 \\ \hline 720 \\ \hline 960 \end{array} \left. \vphantom{\begin{array}{r} 3 \\ 20 \\ \hline 60 \\ 12 \\ \hline 720 \\ \hline 960 \end{array}} \right\} \text{ of 1 d. or } \frac{3}{960} \text{ Ans.}$$

Proof.

$$\begin{array}{r} 720 \\ 4 \\ \hline 2880 \end{array}$$

3)2880(960

Again, Reduce $\frac{3}{4}$ of a *l.* to the Fraction of a Penny.

$$\begin{array}{r} 3 \\ 20 \\ \hline 60 \\ 12 \\ \hline 720 \\ \hline 4 \end{array} \left. \vphantom{\begin{array}{r} 3 \\ 20 \\ \hline 60 \\ 12 \\ \hline 720 \\ \hline 4 \end{array}} \right\} \text{ Facit.}$$

Addition of Fractions.

If the Fractions to be added have a common Denominator, then add all the Numerators together for a Numerator; and place it over the common Denominator.

Example.

Example. What is the Sum of $\frac{2}{5}$, $\frac{3}{5}$, and $\frac{4}{5}$ of a *l.*

$$\begin{array}{r} 2 \\ 3 \\ 4 \\ \hline 9 \\ \hline 5 \end{array}$$

This being an improper Fraction, I reduce it to a mixt Number, and it makes $1 \frac{4}{5}$, or *l.* 1-16.

Or thus : Decimally.			Demonstration.		
$\frac{2}{5}$,4	$\frac{2}{5}$,40	$\left. \begin{array}{l} \frac{2}{5} \\ \frac{3}{5} \\ \frac{4}{5} \end{array} \right\}$	is	0 8 0	
$\frac{3}{5}$,6	$\frac{3}{5}$,60			0 12 0	
$\frac{4}{5}$,8	$\frac{4}{5}$,80			0 16 0	
1,8	1,80, or <i>l.</i> 1-16			1. 1 16 0	<i>Proof.</i>

Here the vulgar Fraction being reduced to Decimals, according to the 16th Rule of this Chapter, I cast up the respective Decimals, as I do whole Numbers, and the Answer is one Integer, and ,8 of an Integer, that is, *l.* 1-16, the 8 Primes being accounted 16*s.* according to the Rule of *Valuation of Decimals*, given in the 17th Rule of this Chapter.

In *Addition of Decimals*, we observe the same Method as in whole Numbers, only in setting down, regard must be had that the fractional Parts stand one under the other, *viz.* Primes, (or Tenths) under Primes; Seconds under Seconds; Thirds under Thirds, &c. And if mixt Numbers are to be added, then the Fractions to stand as before directed, and the whole Numbers to stand as in whole Numbers; that is, Units under Units; Tens under Tens, &c. without any regard to the Fractions annexed.

Examples.

Examples.

Fractions.

.45	.4
.5	.574
.095	.0067
.225	.56

1,270

1,5407

Mixt Numbers.

124.97
7.065
27.5
65,007

224,542

Note, That so many fractional Places that the greatest hath, among those Numbers that are added, so many Places must be pointed off from the Total, towards the Right Hand for Decimal Parts; and the other Figures towards the Left Hand are whole Numbers, as in the foregoing Examples may be observ'd.

Again, Add 4 Foot 3 Inches, 6 Foot 9 Inches, and 8 Foot 6 Inches together.

Feet. Pts.

4	25
6	75
8	50

19, 50 Anfw. 19 Foot $\frac{1}{2}$.

More Examples.

Integers.	Parts.	Decimal Parts of a l.		s.	d.
41	.426	.333	} or, {	6	8
16	.04	.25		5	0
36	.274	.75		15	0
22	.8	.003		0	$0\frac{3}{4}$
		.3		6	0
116	.540				
		1,636		l. 1	12 8 $\frac{3}{4}$

SUB-

SUBTRACTION.

I. As in *Addition*, if the Fractions have unequal *Denominators*, they must be reduced to a common *Denominator* before *Subtraction* can be made. Then subtract one *Numerator* from the other, and place the *Difference* over the common *Denominator*.

From $\frac{7}{8}$ of a *l.* take $\frac{2}{3}$
Decimally.

,875
,666

,209 *Ans.* 4 *s.* 2 *d.*

7 2 8
3 8 3

21 16 24
16

5 } *Ans.* 4 *s.* 2 *d.*
24 }

From $\frac{7}{8}$ take $\frac{2}{3}$. *Ans.* $\frac{1}{24}$ or $\frac{1}{2}$

Decimally.

,875
,375

Ans. .500

From $\frac{1}{2}$ *l.* take $\frac{1}{2}$

16
8

11
8

3 } *Ans.* or
16 } (3 *s.* 9 *d.*

Subtraction of Decimals is the same as in whole Numbers, observing to keep the same Order of placing the Numbers as directed in *Addition of Decimals*.

II. To subtract a Fraction from a whole Number.

Rule. Subtract the Numerator of the Fraction from the Denominator, and the Remainder place over the given Denominator, for a Numerator; and take a Unit from

from the whole Number for what you borrowed, and the Remainder place before the Fraction found; which mixt Number shall be the Difference sought.

Example. Subtract $\frac{6}{8}$ from *l.* 25, *facit* $24 \frac{2}{8}$.

Here 6 from 8 and there rests 2, which I put over the Denominator 8, thus, $\frac{2}{8}$; then 1 from 25, there rests 24, which I place before the Fraction $\frac{2}{8}$, thus $24 \frac{2}{8}$; which is the Difference sought.

From 12 Ells take $\frac{1}{8}$, *facit* $11 \frac{7}{8}$.

Decimally. From ,6875 take ,5 of a *l.*

,5000

—
,1875 *Anf.* or 3 *s.* 9 *d.*

Here the Vacancy is supplied with Cyphers, or they might have been omitted, and only supposed to have been there; and if at any Time there should be a Vacancy in the upper Number, it may be supplied with Cyphers; or, as above said, accounted there.

Example. Subtract this Decimal of a *l.* viz. ,75 from this, whole Number, 25 *l.*

25,00

,75

—
24,25 or *l.* 24-5

Here the Defect (tho' not of Places, yet of Number) is supplied by annexing Cyphers to the whole Number; for otherwise you could not subtract ,75 from 25.

III. To subtract a mixt Number from a whole Number.

Rule. From the Denominator of the Fraction subtract the Numerator, and set the Remainder over the Denominator, and then pay one to the whole Number, and subtract it from the Integer, and the Remainder is the true Difference sought.

Example.

Example. From 12 s. take $5\frac{3}{8}$

$5\frac{3}{8}$	Decimally.
	$12\text{ s. } \dots$
facit $6\frac{5}{8}$ or 6 s. 7 d. $\frac{1}{2}$	5.375
	Ans. 6.625 or 6 s. 7 d. $\frac{1}{2}$

Again. From 24 Ells take 19 Ells $\frac{3}{4}$

Decimally.	19 $\frac{3}{4}$
24	
19,6	4 $\frac{2}{3}$ Answer.
4,4 Answer.	

From 16 C. take C. 13 $\frac{7}{8}$

13 $\frac{7}{8}$	Decimally.
	16,....
2 $\frac{9}{8}$ Answer.	13.4375
	2,5625

IV. To subtract a mixt Number from a mixt Number.

Rule. (1) Take the lesser Numerator from the greater.

Example. From $37\frac{7}{8}$ take $23\frac{3}{8}$.

Decimally.	23 $\frac{3}{8}$
37.875	
23.625	14 $\frac{2}{8}$ Answer.
14.250	

(2.) When a greater Fraction is to be taken from a lesser, then take the Numerator of the greater Fraction from its Denominator, and put the Remainder to the Numerator of the lesser, which is borrowing an Integer, &c.

Example. Take C. $24\frac{1}{2}$ from $35\frac{7}{8}$

C. 35 $\frac{7}{8}$
24 $\frac{1}{2}$
Facit, 10 $\frac{11}{8}$

From

$$\begin{array}{r} \frac{7}{8}, 875 \\ \frac{3}{4}, 75 \\ \hline \end{array}$$

Here are 5 Decimal Places in both the Fractions, therefore all the Product is pointed off for decimal Parts.

$$\begin{array}{r} 4375 \\ 6125 \\ \hline \end{array}$$

,65625 *Ans.* 13s. 1d. $\frac{1}{2}$

II. When a compound Fraction is to be multiplied by a simple one, then reduce the compound Fraction into a simple one, according to the 19th Rule in *Reduction of Fractions*, and work as before.

Example. Multiply $\frac{3}{8}$ of a *l.* by $\frac{5}{8}$ of $\frac{3}{4}$ of a *l.* The compound Fraction being reduced makes $\frac{5}{8} \times \frac{3}{4}$, which multiplied by $\frac{3}{8}$, produces $\frac{45}{64}$, or 3s. 6d.

When a Fraction, or mixt Number, is to be multiplied by a whole Number, constitute a Unit for a Denominator to the whole Number, and then it becomes an improper Fraction; then work as before.

Example. Multiply 24 by $\frac{2}{3}$ (that is $\frac{24}{1}$ by $\frac{2}{3}$.) *facit* $\frac{48}{3}$.
Multiply *l.* 12 by $\frac{3}{8}$ of a *l.*

$\frac{12}{1}$ per $\frac{3}{8}$ *Ans.* $\frac{36}{8}$ or 4*l.* 10s.

Decimally.

$$\begin{array}{r} ,375 \\ 12 \\ \hline \end{array}$$

Facit 4,500 or 4*l.* 10s.

III. When a mixt Number is to be multiplied by a Fraction, reduce the mixt Number into an improper Fraction, and work as before.

Example. $16 \frac{1}{2}$ by $\frac{4}{12}$

2

—

33

—

2 per $\frac{4}{12}$, *facit* $1 \frac{32}{4}$

Multiply $7 \frac{1}{4}$ by $\frac{3}{4}$ of a Yard, *facit* $\frac{87}{16}$, or 5 $\frac{7}{16}$ Yards.
Deci-

Decimally.

$$\begin{array}{r}
 7,25 \\
 ,75 \\
 \hline
 3625 \\
 5075 \\
 \hline
 5,4375
 \end{array}$$

IV. To multiply mixt Numbers by mixt Numbers ; that is, a whole Number and a Fraction by a whole Number and a Fraction,

Rule. Reduce the given Numbers into improper Fractions, and work as before.

Example. Multiply $120 \frac{1}{4}$ by $48 \frac{1}{2}$

$$\begin{array}{r}
 4 \quad 2 \quad 2 \\
 \hline
 481 \quad 481 \quad 97 \quad 8 \text{ Denom.} \\
 \hline
 97 \quad \hline
 4 \quad 2 \\
 \hline
 3367 \\
 4329 \\
 \hline
 \end{array}$$

Denominator, $8)46657$

Answ. $5832 \frac{1}{8}$ Feet.

Or thus: First multiply the whole Numbers together ; as 120 by 48 ; and to the Product add $\frac{1}{4}$ of 48, and $\frac{1}{2}$ of 120. *Example.*

Decimally.

$$\begin{array}{r}
 120,25 \\
 48,5 \\
 \hline
 60125 \\
 96200 \\
 48100 \\
 \hline
 \end{array}$$

$120 \frac{1}{4}$ long.
 $48 \frac{1}{2}$ broad.

$$\begin{array}{r}
 960 \\
 480 \\
 \hline
 60 \text{ the } \frac{1}{4} \text{ of } 120. \\
 12 \text{ the } \frac{1}{2} \text{ of } 48. \\
 \hline
 \end{array}$$

$5832 \frac{1}{8}$ Answer.

$5832,125$ Answer

Then

Then multiply the Fractions by themselves, saying, once 1 is 1, and twice 4 is 8; which produces the $\frac{1}{3}$. as in the *Example*.

And thus, by either of these Ways, having the Length and Breadth of any superficial Quantity, its Contents may be found.

Multiply $2s. \frac{1}{3}$ by $3s. \frac{2}{4}$

$$\begin{array}{r} 3 \frac{2}{4} \\ \hline 6 \\ 1 \\ 1 \\ \hline \end{array}$$

Facit, $8 \frac{2}{12}$, or $8s. 2d.$

Or $2s. 4d$ by $3s. 6d.$

Or thus: *s. d.*

$$\begin{array}{r} 2 \ 4 \\ 3 \ 6 \\ \hline 6 \ 0 \\ 1 \ 0 \\ 1 \ 2 \\ \hline \end{array}$$

Or thus (3)

$$\begin{array}{r} 2 \ 4 \\ 3 \ 6 \\ \hline 7 \ 0 \\ 1 \ 2 \\ \hline 8 \ 2 \end{array}$$

Ans. 8 2

Decimally

$$\begin{array}{r} 2,333 \\ 3,5 \\ \hline 11665 \\ 6999 \\ \hline \end{array}$$

8,1655 Ans. $8s. 2d.$

The second of these Ways is called *Cross Multiplication* or *Duo-Decimals*, by which Shillings and Pence may be multiplied by Shillings and Pence; or Feet and Inches by Feet and Inches, carrying the same from one Denomination to the next; for as 12 Pence make a Shilling, so do so many Inches a Foot. In the Work I first multiply the whole Numbers by themselves, saying 3 times 2 is 6; then cross-ways, I say, 6 times 2 is 12 *d.* or 1 *s.* and 3 times 4 is 12 *d.* or 1 *s.* Then the Pence by the Pence, saying 6 times 4 is 24, which I divide by 12, saying the 12's in 24, twice, &c.

But

But the third and best Way is wrought *practically*, and the last *Decimally*; each Method producing the same answer; as may be seen in each Work.

Multiply $l. 3 \ 15 \ 9$
By $14,7,6$

$15 \ 3 \ 0$	
$9 \ 5 \frac{1}{2}$	
$9 \ 5 \frac{1}{2}$	
$9 \ 5 \frac{1}{2}$	

Facit, $l. 16 \ 11 \ 4 \frac{1}{2}$ $2s. \frac{1}{10}$
 $1s. \frac{1}{10}$

$l. 84 \ 13 \ 6$
 $l. 17,3$

$338 \ 14 \ 0 p. 4 \& 4$
 4

$1354 \ 16 \ 0$	
$84 \ 13 \ 6$	
$8 \ 9 \ 4 \frac{2}{10}$	
$4 \ 4 \ 8 \frac{1}{10}$	

$l. 1452 \ 3 \ 6 \frac{3}{10}$

By the same Method may be multiplied Weight or Measure.

D I V I S I O N.

I. If the Fractions are single, and have a common *Denominator*; divide one *Numerator* by the other, and the *Quotient* is the Answer in whole Numbers.

Examples.

Divide $\frac{6}{8}$ by $\frac{3}{8}$, facit 2

Divide $\frac{9}{12}$ by $\frac{3}{12}$, facit 3

Divide $\frac{27}{32}$ by $\frac{3}{32}$, facit, 9

II. *Division of Decimals*, is work'd just as it is in whole Numbers, only when the Work is over, you must point off as many Places from the Quotient, for decimal Parts, as the *Dividend* has more than the *Divisor*; that is, there must be as many decimal Places in the *Divisor* and Quotient, as there are in the *Dividend*; but if not, the

the Defect must be supplied by Cyphers being annex'd to the Left Hand of the Quotient, and is just the Converse of Multiplication of Decimals.

III. When the Divisor consists of more Places than the Dividend, a competent Number of Cyphers must be annex'd to the Dividend, before you can make a Division.

Example. Let us divide the first Sum on the other Side *decimally*; when the Fractions are reduced to Decimals, they make .75, to be divided by .375, wherefore I join a Cypher to the Dividend, .75, thus, .750, and then divide as in whole Numbers.

$$\begin{array}{r} .375 \overline{) .750} (2 \\ \underline{750} \\ (0) \end{array}$$

IV. When in Vulgar Fractions, the *Dividend* and *Divisor* are both simple Fractions, then multiply the *Numerator* of the *Dividend* by the *Denominator* of the *Divisor*, for a *Numerator*; and also multiply the *Denominator* of the *Dividend* into the *Numerator* of the *Divisor*, for a *Denominator*, and the Work is done.

Example.

What is the Quotient of $\frac{3}{4}$ of a *l.* divided by $\frac{3}{4}$ of a *l.*
 $\frac{3}{4}) \frac{3}{4} (\frac{16}{15}$ *Ans.*

Divide $\frac{12}{14}$ by $\frac{9}{14}$, *Facit* $\frac{144}{126}$, or $\frac{8}{7}$.

Or you may reduce the Fractions to a common *Denominator*, and then divide the new *Numerator* of the *Dividend* by the new *Numerator* of the *Divisor*.

O

Example.

Example.

Divide $\frac{12}{4}$ by $\frac{9}{12}$, $\frac{144}{128}$, $\frac{126}{8}$.
 126) 144 (1 $\frac{18}{28}$ Answer.

V. To divide a whole Number by a Fraction, multiply the Integer by the Denominator of the Fraction, and divide by the Numerator.

*Example.*Divide 15 Yards by $\frac{3}{4}$ *Decimally.*

$$\begin{array}{r} 75 \overline{) 15,00(20} \\ 150. \\ \hline (0) \end{array}$$

$$\begin{array}{r} 15 \\ 4 \\ \hline \end{array}$$

3)60(,20 *Answ.*

VI. To divide a Fraction by a whole Number, let the Numerator stand as Numerator, and multiply the Integer into the Denominator for a Denominator.

Example.

Divide $\frac{2}{3}$ of an Ell by 9 Ells, *facit* $\frac{2}{45}$.

Decimally.

$$\begin{array}{r} 9 \overline{) 400(} \\ \hline \end{array}$$

044 *Answ.*

VII. To divide a mixt Number by a whole Number, reduce the mixt Number into an improper Fraction, and by its Denominator multiply the Integer for a Divisor.

Example.

Divide $5 \frac{3}{4}$ Yards by 4 Yards.

$$\begin{array}{r} 4 \\ \overline{)23} \end{array}$$

4 *Decimally.*

$$4 \overline{)5.750}$$

Facit. 1.437

$$\begin{array}{r} 4 \\ \overline{)23} \end{array} \quad \begin{array}{r} 16 \\ \overline{)23} \end{array} \quad \begin{array}{r} 17 \\ \overline{)23} \end{array} \quad \begin{array}{r} 16 \\ \overline{)23} \end{array} \quad \begin{array}{r} 7 \\ \overline{)23} \end{array}$$

VIII. To divide a mixt Number by a Fraction, reduce the mixt Number into an improper Fraction, and then multiply the Numerator of the improper Fraction, by the Denominator of the Fraction, and the Denominator of the improper Fraction by the Numerator.

Example.

Divide $1 \frac{12}{3}$ by $\frac{3}{8}$

$$\begin{array}{r} 3 \\ \overline{)38} \end{array}$$

$$\begin{array}{r} 3 \\ \overline{)38} \end{array}$$

Decimally.

$$\begin{array}{r} 3 \\ 5 \\ \overline{)15} \end{array}$$

$$.625 \overline{)12.666666} \quad (20.266 \text{ Answer.})$$

$$\begin{array}{r} 38 \\ \overline{)38} \end{array} \quad \begin{array}{r} 38 \\ \overline{)38} \end{array} \quad \begin{array}{r} 38 \\ \overline{)38} \end{array} \quad \begin{array}{r} 38 \\ \overline{)38} \end{array} \quad \begin{array}{r} 38 \\ \overline{)38} \end{array}$$

IX. To divide a whole Number by a mixt Number, reduce the mixt and whole Numbers into improper Fractions, and work as before.

*Example.*Divide $l. 48$ by $12 \frac{1}{2}$

$$\begin{array}{r}
 48 \\
 2 \cdot \\
 \hline
 25)96(3\frac{2}{5} \text{ Anf.} \\
 75 \\
 \hline
 21
 \end{array}$$

$$\begin{array}{r}
 \hline
 2 \\
 1 \quad \hline
 25 \\
 \hline
 2
 \end{array}$$

Decimally. $12,5)48,000(3,84 \text{ Answ.}$

X. To divide a mixt Number, by a mixt Number, bring them into proper Fractions, and work as before.

*Example.*Divide $8 \frac{3}{4}$ Yards by $5 \frac{1}{2}$ Yards

Decimally.

$$\begin{array}{r}
 5,5)8,750(1,59 \\
 55 \cdot \cdot \\
 \hline
 325 \\
 275 \\
 \hline
 500 \\
 495 \\
 \hline
 (5)
 \end{array}$$

$$\begin{array}{r}
 4 \quad 2 \\
 \hline
 35 \quad 11 \\
 \hline
 4 \quad 2 \\
 \hline
 44)70(1 \frac{25}{44} \\
 44 \\
 \hline
 26
 \end{array}$$

The Rule of THREE.

Here, as in whole Numbers, the first and third Numbers must be of one Denomination, and as is the Stat- ing, so is the Operation the same, viz. second and third Numbers are multiplied together, and that Product di- vided by the first; according to the foregoing Rules of working Fractions.

Example.

Example.

If $\frac{3}{4}$ Yard of Cloth cost $\frac{4}{5}$ of a *l.* what $\frac{5}{6}$ of a Yard?

$$\begin{array}{r} 4 \\ \hline 20 \end{array} \qquad \begin{array}{r} 5 \\ \hline 30 \end{array}$$

$\frac{3}{4}$)30($\frac{80}{90}$ Anfw. $\frac{8}{9}$ or 17 *s.* 9 *d.* $\frac{1}{3}$

When the *Numerator* and *Denominator* both terminate with a Cypher or Cyphers, they may be cut off, and the Fraction still retains the same Value.

There is another and better Way of working the Question, when it is stated, which is thus:

Multiply the *Numerators* of the first, into the *Denominators* of the second and third Fractions for a new *Denominator*; and then the *Denominator* of the first Fraction into the *Numerators* of the second and third, for a new *Numerator*; which, if an improper Fraction, may be reduced into a whole or mixt Number.

Example.

If $\frac{3}{4}$ Yard cost $\frac{4}{5}$ *l.* what $\frac{5}{6}$ Yard? Anfw. $\frac{8}{9}$ *l.*

$$\begin{array}{r} 4 \\ \hline 16 \\ 5 \\ \hline 80 \end{array} \qquad \begin{array}{r} 3 \\ \hline 15 \\ 6 \\ \hline 90 \end{array}$$

Facit $\frac{80}{90}$, as before.

The foregoing Questions wrought Decimally.

If ,75 *Yds.* cost ,8 *l.* what ,833 *Yards*?

$$\begin{array}{r} ,8 \\ \hline ,75),66640(,888 \end{array} \text{ Anfw. or } 17 \text{ s. } 9 \text{ d. } \frac{1}{3}$$

Q 3

If

lb.	s.	lb.
If $2\frac{3}{4}$ Tobacco cost	$3\frac{1}{2}$ what	$242\frac{1}{4}$?
<u>4</u>	<u>2</u>	<u>4</u>
11	7	969
<u>4</u>	<u>2</u>	4
7	11	
<u>28</u>	<u>22</u>	
969	4	
<u>252</u>	88 Denominator.	
168		
252	27132	} Answer.
27132 Numerator.	88	
	88)27132(30 8	
	l. 15 8 3 $\frac{3}{4}$ Facit.	

Decimally.

l.	s.	l.
If 2.75	— 3.5 —	242.25
		<u>3.5</u>
		121125
		<u>72675</u>
		2.75)847.875(30 8.3
		Answ. l. 15 8 3 $\frac{3}{4}$

Here the Operation is just as it is in whole Numbers.

Before

Chap. 19. *Vulgar and Decimal.* 309

Before I conclude, I shall work some Examples in Interest by Decimals, by which may be seen that the Decimal Way, in some Cases, has the Advantage of the Vulgar.

Simple Interest.

Example 1. What is the Amount of a Year's Interest of 826 *l.* 13 *s.* 9 *d.* at 5 *per Cent.*

826,687
 ,05

Answer, 41,33435

Or, *l.* 41 6 8 $\frac{1}{4}$ according to the Rule of valuing a Decimal in Reduction of Fractions.

Here the 13 *s.* 9 *d.* is reduced to the Decimal, ,687, and annexed to the whole Number, 826 *l.* with the Decimal Characteristick between them; which multiplied by ,05 the Decimal of the Rate, *viz.* 5 *per Cent.* which is found by annexing Cyphers to the Rate, and dividing by 100, thus:

per Cent.

100)5,00,05

According to the Way of Valuing the Quotient in Division of Decimals, *viz.* the Quotient must have as many Decimal Places as the Dividend exceeds the Divisor. After the same Manner the Decimal for 4 *per Cent.* is found to be ,04, and of 6, ,06, &c.

Example 2.

What is the Year's Interest of 348 l. 13 s. 2 d. at 6 per Cent. per Annum?

l. 348,658
 ,06

20,91948 Answ. l. 20 18 4 $\frac{1}{2}$

Here there are as many decimal Places separated to the Right Hand, as there are decimal Places to both Multiplicand and Multiplier, according to the Rule of Multiplication in *Decimals* (as in the foregoing Example also) and the decimal Parts will be found to be 18 s. 4 d. $\frac{1}{2}$ according to the Rule of valuing a *Decimal* of Money, &c.

Example 3

What's the Year's Interest of

l. 326, — at — 4 per Cent?

,04

13,04 Answ. l. 13 00 9 $\frac{1}{2}$

When the Simple Interest of any Sum is required for 2, 3, 4, 5 Years, &c. it's only to find the Interest for 1 Year, and then to multiply that Interest by 2, 3, 4, or 5, &c.

Example

Example 4.

What's the Interest of 324*l.* 10*s.* for 4 Years, at 4 per Cent. per Annum?

$$\begin{array}{r}
 1. \\
 324,5 \\
 ,04 \\
 \hline
 12,980 \text{ Ans. for 1 Year } \begin{array}{r} 12 \quad 19 \quad 7 \frac{1}{4} \\ \text{Years 4} \end{array} \\
 \hline
 \text{Ans. } \begin{array}{r} 1. \quad 51 \quad 18 \quad 5 \end{array}
 \end{array}$$

If the Interest required be for Parts of a Year, *i. e.* Months, &c. take such Parts of the Year's Interest, as 6 Months is the $\frac{1}{2}$, 3 Months the $\frac{1}{4}$, and 4 Months the $\frac{1}{3}$, &c.

To find the Interest of any Sum of Money, for any Number of Days, at any Rate of Interest.

Rule. Multiply the Principal by the Rates of Interest, and then that Product by the Number of Days, which reserve for a Dividend (which divided by 365,00 the common Divisor for all Rates, is the Days of the Year multiplied by 100) answers the Question.

Example.

What's the Interest of 240*l.* for 96 Days at 5 per Cent. per Annum?

$$\begin{array}{r}
 5 \\
 \hline
 1200 \\
 96 \\
 \hline
 365,00 \overline{) 1152,00} \text{ Ans. } \begin{array}{r} 1. \quad 3 \quad 3 \quad 1 \frac{1}{4} \end{array}
 \end{array}$$

Q 5

Like

Likewise there may be found Decimal Numbers correspondent to the Duty or Custom on Tobacco, and Holland Cloth, viz.

	240 lb.		
1 d. per lb.	1 lb	Old Subsidy	,95
5 per Cent. cut off	,05	New Subsidy	,92625
		Addit. Duty	,87875
Old Subsidy	,95	$\frac{1}{3}$ New Subsi.	,29485625
2 $\frac{1}{2}$ per Cent. off	,02375	Impost	2,484
New Subsidy	,92625	Duty of } 240 l. }	5,53385625
5 per Cent. more			
off the Old, viz. }	,0475		
7 d. $\frac{1}{2}$			
Additional Duty	,87875		
$\frac{1}{3}$ of the New	,30875		
Subsidy with }	,01389375		
4 per C. off			
	,29485625		

3 d. per lb. 3, 0
10 per Cent. off ,3

2,7
8 per Cent. off ,216

Impost 2,484
And so for Holland Cloth.

So some of the Rules of Practice may be work'd by Decimals, but shorter by Vulgar Fractions.



A N
A P P E N D I X.

Containing the Construction and Uses of

T A B L E S,

For calculating Questions in

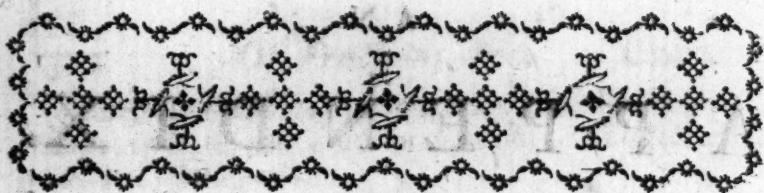
COMPOUND INTEREST.

A N D,

*Annuities or Leases in Possession or
Reversion.*



BELFAST: Printed in the Year, 1775.



OF

COMPOUND INTEREST.

COMPOUND INTEREST, is that which arises from any Principal and it's Interest put together, as the Interest becomes due, so that at every Payment or Time when the Payment becomes due, there is created a new Principal, and for that Reason it is called Interest upon Interest, or Compound Interest.

And altho' it be not lawful to let out Money at Compound Interest, yet in purchasing of Annuities, &c. and taking Leases in Reversion it is very usual to allow Compound Interest to the Purchaser for his ready Money.

In Computations of this kind whether they are about Money forborn at Interest, or those relating to Annuities, &c. we generally make Use of the Amount of a Pound one Year; the Amount of a Pound for a Year at any given Rate of Interest *per Cent.* may be found by this Proportion.

As 100 is to 106, so is 1 to 1,06, the Amount of a Pound at 6 *per Cent.*

Or, as 100, is to 107, so is 1 to 1,07, the Amount of a Pound at 7 *per Cent.* And so on for any Rate of Interest.

The Construction of Tables, for Calculation of Questions in Compound Interest and Annuities, or Leases in Possession or Reversion.



TABLE

Years	TABLE 1. Shewing the Amount of a Pound for 31 Years at 5 and 6 per Cent. Compound Interest.		TABLE 2. Shewing the Rebate of 1 Pound for 31 Years at 5 and 6 per Cent. Compound Interest.	
	5	6	5	6
1	1. 050000	1. 060000	. 952381	. 943396
2	1. 102500	1. 123600	. 907030	. 889996
3	1. 157625	1. 191016	. 863837	. 839619
4	1. 215506	1. 262477	. 822703	. 792093
5	1. 276281	1. 338225	. 783526	. 747258
6	1. 340096	1. 418519	. 746215	. 704960
7	1. 407100	1. 503630	. 710683	. 665057
8	1. 477455	1. 593848	. 676839	. 627412
9	1. 551328	1. 689479	. 644609	. 591898
10	1. 628895	1. 790848	. 613913	. 558394
11	1. 710339	1. 898298	. 584679	. 526787
12	1. 795856	2. 012196	. 556837	. 496969
13	1. 885649	2. 132928	. 530321	. 468839
14	1. 979932	2. 260904	. 505068	. 442301
15	2. 078928	2. 396558	. 481017	. 417265
16	2. 182874	2. 540352	. 458111	. 393647
17	2. 292018	2. 692773	. 436296	. 371364
18	2. 406619	2. 854339	. 415520	. 350343
19	2. 526950	3. 025599	. 395734	. 330513
20	2. 653298	3. 207135	. 376889	. 311804
21	2. 785902	3. 399564	. 358942	. 294115
22	2. 925261	3. 603537	. 341849	. 277505
23	3. 071524	3. 819750	. 325571	. 261797
24	3. 225100	4. 048935	. 310067	. 246978
25	3. 386355	4. 291871	. 295302	. 232998
26	3. 555673	4. 549383	. 281240	. 219810
27	3. 733456	4. 822346	. 267848	. 207368
28	3. 920129	5. 111687	. 255093	. 195630
29	4. 116135	5. 418388	. 242946	. 184556
30	4. 321942	5. 743491	. 231377	. 174110
31	4. 538030	6. 088101	. 220359	. 164254

*The Constructions and Uses of the foregoing Tables.**The Construction of the first Table.*

By the Proportion above, find the Amount of a Pound for one Year, which multiply'd by itself, gives the Amount for the second Year, and that Product multiplied by the Amount of a Pound for one Year, gives the Number for the third Year; and so multiplying the Amount for every precedent Year, by the Amount of a Pound for one Year, the Product will be the Amount for every following Year, till the whole Table be finished.

But the most expeditious Method, is by the Logarithms thus: Find the Logarithm of the Amount of a Pound for a Year, and add that Logarithm to itself, the Sum is the Logarithm of the Number belonging to the second Year, and to that Sum add again the Logarithm of the Amount, gives the Logarithm of the Number belonging to the third Year, and thus adding the Logarithm of the Amount of a Pound for a Year, to the Logarithm of the Amount for any Precedent Year, that Sum will be the Logarithm of the Number belonging to the following Year, till the whole Table be finished.

The Construction of the second Table.

Divide Unity (or the Number 1) by the Numbers in the first Table, and the Quotients will be the Corresponding Numbers in the second Table.

As for Example.

Under 5 per Cent.

$$1 \text{ Divided by } \left\{ \begin{array}{l} 1.050000 \\ 1.102500 \\ 1.157625 \\ \&c. \end{array} \right\} \text{ will give } \left\{ \begin{array}{l} .952381 \\ .907030 \\ .863837 \\ \&c. \end{array} \right.$$

After the same Manner the Numbers at 6 per Cent. were found.

The

Compound Interest.

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The Use of the first Table.

What Sum will 567 *l.* 10 *s.* Amount to in 9 Years,
at the Rate of 6 *l.* per Cent.

In the first Table under 6 per Cent. and over against
9 Years is 1,689479
Which multiply'd by 567,5

8447395
11826353
10136874
8447395

The Product is 958,7793325 Which is } *l. s. d.*
equal to } 958 15 7

The Use of the second Table.

What ready Money will pay a Debt of 46 *l.* 10 *s.*
due 22 Years hence, at 6 per Cent.

In the 2d Table under 6 per Cent. and over against
22 Years is ,277505
Multiply'd by 46,5

1387525
1665030
1110020

The Prod. is 12,9039825 Equal to *l. s. d.* 12 18 0 $\frac{1}{2}$

TABLE 31

TABLE 3.

A TABLE shewing the Amount of one Pound Annuity forborn thirty one Years, at 5 and 6 per Cent.

Years	5	6
1	1. 000000	1. 000000
2	2. 050000	2. 060000
3	3. 152500	3. 183600
4	4. 310125	4. 374616
5	5. 525621	5. 637092
6	6. 801913	6. 975381
7	8. 142008	8. 393837
8	9. 649108	9. 897647
9	11. 026564	11. 491315
10	12. 577892	13. 108794
11	14. 206787	14. 971642
12	15. 917126	16. 869946
13	17. 712982	18. 882137
14	19. 598631	21. 015165
15	21. 578563	23. 275969
16	23. 657491	25. 672527
17	25. 840366	28. 212879
18	28. 132384	30. 905651
19	30. 539003	33. 759990
20	33. 065954	36. 715590
21	35. 719251	39. 992725
22	38. 505214	43. 392289
23	41. 430475	46. 995826
24	44. 501999	50. 815575
25	47. 727099	54. 864510
26	51. 113453	59. 156381
27	54. 669126	63. 705763
28	58. 402583	68. 528109
29	62. 322712	73. 639796
30	66. 438847	79. 058184
31	70. 760790	84. 801675

The Construction and Use of this Table is as follows.

ITS CONSTRUCTION.

Divide each of the given Numbers of the first Table less by Unity by the Amount of a Pound for a Year (less by Unity) and the Quotients will give the Numbers in this Table.

Which are the Numbers for the first 3 Years less by Unity.

Divided by .05 the Amount of a Pound less by Unity, the Quotients will be The Numbers for the first 3 Numbers in this Table.

After the same Manner the whole Table may be constructed.

The Use of the foregoing Table.

I demand what an Annuity of 46*l.* 12*s.* 6*d.* will amount to, forborn 9 Years at 5 per Cent.

In the 3d Table opposite 9 Years, and under 5 per Cent. is
Multiply'd by

$$\begin{array}{r}
 11,026564 \\
 46,625 \\
 \hline
 55132820 \\
 22053128 \\
 66159384 \\
 66159384 \\
 \hline
 44106256
 \end{array}$$

The Prod. is 514,113546500 Equal to 514 2 3 $\frac{1}{2}$ *l. s. d.*

TABLE 4.

Years	TABLE 4. Shewing the Present Worth of one Pound Annuity to continue for 31 Years, at 5 and 6 per Cent.		TABLE 5. Shewing what Annuity to continue for 31 Years will purchase at 5 and 6 per Cent.	
	5	6	5	6
1	0. 952381	0. 943396	1. 050000	1. 060000
2	1. 859410	1. 833392	. 537805	. 543637
3	2. 723248	2. 673012	. 367208	. 374110
4	3. 545950	3. 465105	. 282012	. 288591
5	4. 329477	4. 212363	. 230952	. 237396
6	5. 075692	4. 917324	. 197017	. 203363
7	5. 786373	5. 582381	. 172820	. 179135
8	6. 463212	6. 209792	. 154722	. 161036
9	7. 107821	6. 801691	. 140691	. 147022
10	7. 721734	7. 360086	. 129505	. 135868
11	8. 306414	7. 886873	. 120389	. 126793
12	8. 863251	8. 383843	. 112825	. 119272
13	9. 393572	8. 852682	. 106456	. 112960
14	9. 898640	9. 294983	. 101023	. 107585
15	10. 379658	9. 712248	. 096342	. 102963
16	10. 837769	10. 105894	. 092270	. 098952
17	11. 274065	10. 477258	. 088699	. 095445
18	11. 689586	10. 827602	. 085546	. 092356
19	12. 085320	11. 158115	. 082745	. 089621
20	12. 462209	11. 469920	. 080242	. 087184
21	12. 821155	11. 764075	. 077996	. 085004
22	13. 163002	12. 041580	. 075970	. 083045
23	13. 488573	12. 303377	. 074137	. 081278
24	13. 798641	12. 550356	. 072441	. 079679
25	14. 093944	12. 783354	. 070952	. 078227
26	14. 375184	13. 003164	. 069564	. 076904
27	14. 643033	13. 210531	. 068292	. 075697
28	14. 898127	13. 406162	. 067122	. 074592
29	15. 141073	13. 500719	. 066045	. 073579
30	15. 372450	13. 764829	. 065051	. 072649
31	15. 592810	13. 929084	. 064132	. 071702

Compound Interest.

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The Construction of the Fourth Table.

Divide each Number of the Third Table by the Number corresponding in the same Year in the First Table, their respective Quotients will give the Numbers corresponding to the same Years in this Table.

$$\begin{array}{l} \text{Thus} \left\{ \begin{array}{l} 1.000000 \\ 2.050000 \\ 3.152500 \\ \text{\&c.} \end{array} \right\} \text{Divide by} \left\{ \begin{array}{l} 1.050000 \\ 1.102500 \\ 1.157625 \\ \text{\&c.} \end{array} \right\} \text{Will give} \left\{ \begin{array}{l} 0.952381 \\ 1.859410 \\ 2.723248 \\ \text{\&c.} \end{array} \right\} \end{array}$$

The Construction of the Fifth Table.

Divide Unity by the Numbers in the Fourth Table, the Quotients will be the Numbers in the Fifth Table.

The Use of the Fourth Table.

Example 1.

Suppose a Lease of 250*l.* *per Annum*, were to be let for 21 Years; what may the present Worth of that Lease be, at the Rate of 5 *per Cent*.

Multiply the Number under 5 *per Cent.* and over against 21 Years, *viz.* 12.821155

By 250

641057750

25642310

Product 3205.288750 Equal to 3205 5 9 $\frac{1}{4}$

l. s. d.

Example 2.

There is a Lease of Lands worth 32*l.* *per Annum* more than the Rent paid to the Lord; of which Land there is yet a Lease in Being for 7 Years; and the Lessee is desirous to take a Lease in Reversion for 21 Years, to begin when his old Lease is expired. What Sum of Money is to be paid for this Lease, allowing Interest at the Rate of 6 *per Cent*.

First,

First, See what this Rent of 32 *l.* is worth for 7 Years, which will be 178 *l.* 12 *s.* 9 *d.*

Secondly, Add 7 Years to 21 Years, which makes 28 Years; then see what 32 *l.* to continue 28 Years is worth, which will be 428 *l.* 19 *s.* 11 *d.* $\frac{1}{2}$.

Lastly, Subtract the present Worth for 7 Years, from the present Worth for 28 Years, the Difference is the Answer to the Question, to wit, 250 *l.* 7 *s.* 2 *d.* $\frac{1}{2}$

The Work for 7 Years,

5,582381

32

11164762

16747143

178,636192

For 28 Years.

13,406162

32

26812324

40218486

428,997184

From 428,997184

Take 178,636192

l. *s.* *d.*

Product 250,360992 Equal to 250 7 2 $\frac{1}{2}$

The Use of the Fifth Table.

What Annuity or yearly Rent, to continue 22 Years, may be purchased for 965 *l.* 10 *s.* at the Rate of 6 *per Cent.* *per Annum.*

In Table Five, over against 22, and under 6 *per Cent.* is

,083045

Multiplied by 965,5

415225

415225

498270

747405

l. *s.* *d.*

Product 80,1799475 Equal to

80 3 7

The

The Application of the foregoing Tables, to find the present Worth in Reversion.

Example.

There is one who has nine Years to come in a Lease of 175 *l. per Annum*, and he is desirous to enlarge his Time 11 Years more, (*viz.* to enjoy it 20 Years to come;) what sum must be given in ready Money for that Purchase, allowing the Rate of 6 *per Cent.* to the Purchaser.

The first Work in this Question, is to find the present Worth of 175 *l.* to continue 11 Years, at 6 *per Cent.* over against 11 Years is

7,886873

Multiply by

175

39434365

55208111

7886873

1380,202775

Then by the Second Table find the Rebate for 9 Years, which will be the Sum required.

In the 2d Table at the Rate of 6 *per Cent.* opposite to 9 is

,591898

Multiply'd by

1380,2

1183796

47351840

1775694

591898

Product

816.9376196 Equal to 816 18 9

l. s. d.

To conclude this TREATISE, I shall here lay down the Practice of *cross Multiplication*, as it is commonly made use of in the Measure of *Mason* and *Carpenter* Work.

As the *French* divide their Inch into twelve Lines, so our *Masons*, in measuring their Work, suppose the Inch divided

divided into twelve equal Parts, which we shall likewise call Lines: So the Measure, upon which our Calcul depends, stands thus:

Lineal, or Length-measure. Superficial Measure.

12 lines	} are	1 inch	} are	144 lines	} are	1 inch
12 inches		1 foot		144 inches		1 foot
3 feet		1 yard		9 feet		1 yard
6 yards		1 rood		36 yards		1 rood

Solid Measure.

1728 lines	} are	1 inch
1728 inches		1 foot
27 feet		1 yard
216 yards		1 rood

The *superficial content* of any *rectangular quadrilateral* figure, is found by multiplying the length by the height or breadth; and that of a *right-angled Triangle* is found by multiplying the base by $\frac{1}{2}$ the height.

Solid Measure is found by multiplying the surface by the thickness.

The lengths, breadths and thicknesses, are taken in lineal feet, inches and lines; so the whole calcul of the *contents* is performed by a *cross Multiplication* of feet, inches and lines, by feet, inches and lines.

Example 1. In an area, paved with free stone, in length 22 feet 4 inches, and in breadth 19 feet 7 inches, how many square feet?

Answer, 437 feet, 4 inches, 4 lines.

Here I multiply my 22 feet in the *Multiplicand*, by 19 feet in the *Multiplier*, and I have 418 square feet; then I multiply 19 feet into 4 inches in the *Multiplicand*, the *Product*, 76, affords 6 twelves, or 6 feet, 4 inches.

Next, I multiply 7 inches in the *Multiplier* into 22 feet in the *Multiplicand*, the *Product*, 154, affords 12 feet, which I set down under feet, and the remaining 10 inches I set under inches; then I multiply 7 inches into 4 inches, the *Product*, 28, gives 2 in-

F.	in.	l.
22	4	0
19	7	0
418	0	0
6	4	0
12	10	0
	2	4
437	4	4
		ches,

ches, which I set down under inches, and the remaining 4 set in the place of lines; these added, give the *Answer* 437 feet, 4 inches, 4 lines.

If I would reduce this *Product* to yards, I divide my 437 feet by 9, the number of square feet in a square yard, as in the margin, and have my area, 48 yards, 5 feet, 4 inches, 4 lines.

	F.	in.	l.
9)437	4	4	
	yds.	f.	in.
	48	5	4
			4

If I would reduce these 48 yards to roods, I divide by 36, the number of yards in a rood, and find my area to be 1 rood, 12 yards, 5 feet, 4 inches, 4 lines.

36)48	(1 rood.
36	
—	
	12 yards.

Example 2. In a floor 49 feet, 7 inches, 4 lines long, and 26 feet 6 inches broad, how many square feet?

Answer, 1314 feet, 8 inches, 4 lines.

Here, as in the former *Example*, I first multiply my 26 feet into the whole *Multiplicand*, and then my 6 inches into the whole *Multiplicand*.

	F.	in.	l.
49	7	4	
26	6	0	
1274	0	0	
15	2	0	
0	8	8	
24	6	0	
	3	6	
		2	
1314	8	4	

In multiplying my 26 feet into 4 lines, the *Product*, 104, affords 8 twelves, or 8 inches, and 8 lines, and in multiplying my 6 inches into 4 lines, the *Product*, 24, affords just 2 lines.

Example 3. In a piece of timber, whose length is 17 feet 6 inches, breadth 1 foot 11 inches, and thickness 2 feet 7 inches, how many solid feet?

Answer, 86 feet, 7 inches, 9 lines $\frac{1}{2}$.

Here

Here I first multiply my length, 17 feet, 6 inches, by 1 foot 11 inches of breadth, and find the *superficial* measure of the base of my *solid* to be 33 feet, 6 inches, 6 lines, which I multiply by the thickness, 2 feet 7 inches, and find the *solid content* to be 86 feet, 7 inches, 9 lines; for the Fraction of the line may be neglected.

F.	in.	l.
17	6	0
1	11	0
17	6	0
15	7	0
	5	6
33	6	6
2	7	
66	0	0
1	0	0
0	1	0
19	3	0
00	3	6
00	0	3 6
86	7	9 6

Let these three *Examples* suffice to illustrate and explain the use and practice of *cross Multiplication* in the mensuration of *Surfaces* and *Solids*. Mean time, I could heartily wish, that these Gentlemen, who have daily occasion for that kind of measure, would rather choose the *decimal* way of working, as being fully as expeditious, and less liable to mistakes, especially considering in our rulers of foot-measure the inch is divided, not into twelve, but ten equal parts, which naturally introduces the *decimal* way. And I must here take notice, that, in working *decimally*, we have real solid inches, or 1728th parts of a solid foot; and in superficial measure we have real square inches, or 144th parts of a square foot; whereas, in working by *cross Multiplication*, we have only 12th parts of a solid foot, which we call inches, and only 12th parts of a square foot, which we call square inches.

F I N I S.

